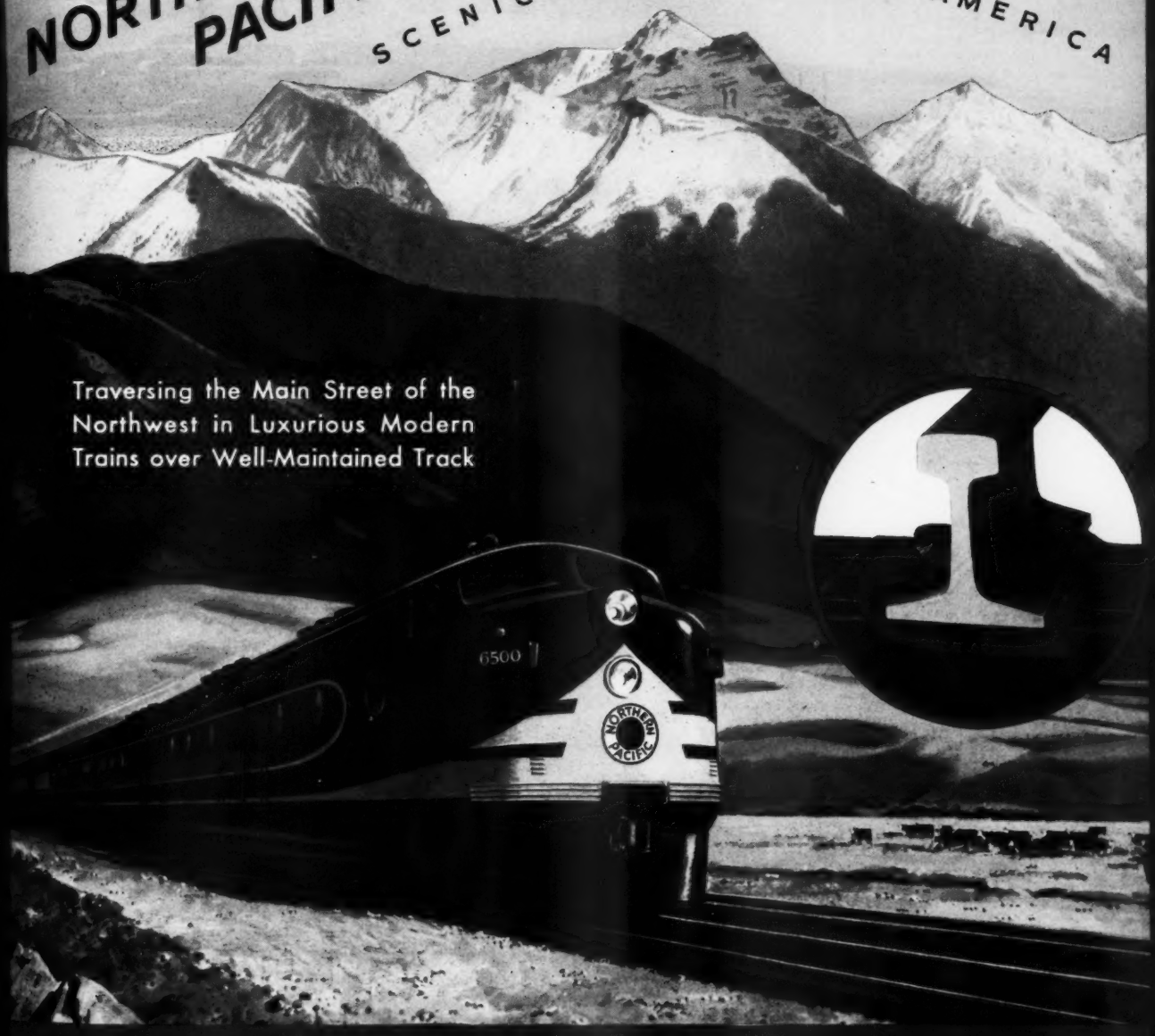
ROADMASTERS' CONVENTION NUMBER
OCTOBER, 1950

Railway Engineering and Maintenance

NORTHERN PACIFIC
SCENIC ROUTE ACROSS AMERICA



Traversing the Main Street of the Northwest in Luxurious Modern Trains over Well-Maintained Track

THE RAILWAY AGE CO.
CHICAGO • NEW YORK • DENVER • WASHINGTON • ST. LOUIS • CLEVELAND • ST. PAUL • BOSTON • SAN FRANCISCO

A Work-Saving Device

every maintenance engineer can use

Powered spike drivers, power adzes, compressed air ballast tampers and portable rail croppers are important, modern labor and cost saving devices. Reliance Hy-Pressure Hy-Crome Spring Washers also do their share to help reduce costs on maintenance of rail-joint assemblies.

The reactive pressure of Reliance Hy-Pressure Hy-Crome Spring Washers on rail-joint bolts automatically compensates for dimensional changes in rail-joint assemblies resulting from wear, stress and strains of heavy wheel loads at high speeds—keeps them *tighter longer*. A tight rail joint reduces rail-end batter and prolongs the life of the rail-joint splice bar.

Put Reliance Hy-Pressure Hy-Crome Spring Washers on your rail-joint bolts and let them automatically help you reduce maintenance costs and extend the interval between track-bolt tightening maintenance periods.

Edgemark of Quality

Reliance **HY-PRESSURE HY-CROME** *spring washers*

EATON

EATON MANUFACTURING COMPANY

RELIANCE DIVISION
Offices and plant: MASSILLON, OHIO

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

KEEP Switches FREE OF SNOW AND ICE WITH BETHLEHEM *Winter Kings*

Yes, there *is* a sure, low-cost method of preventing freeze-ups at switches and slips. It's the Bethlehem Winter King method, successfully used for many years by railroads in the "cold country."

The Winter King Switch Heater fights snow as it falls, killing off ice before it gets a foothold. This sturdy little device has a shielded flame that burns steadily beneath rail and switch point—a flame that can easily be regulated to local conditions. Even in gusty wind the flame stays alive, thereby eliminating freeze-ups far more effectively than hand methods ever could.

Winter Kings fit conveniently between ties, with the fuel chamber always accessible. Fuel (low-priced kerosene) can safely be added while the flame is burning. After the filling, a self-closing cover snaps briskly into place and effectively shuts out dirt and cinders.

Final good point: you won't spend a fortune buying and maintaining Winter Kings. They're so very inexpensive in first cost, and maintenance is practically nothing. Try some this winter; get 'em now before the cold weather really sets in.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Published monthly by Simmons-Boardman Publishing Corporation, 79 W. Monroe St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00 for one year; $3.00 for two years. Single copies 50 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Marion, Ind., post office. Address communications to 79 W. Monroe St., Chicago 3, Ill. Volume 46, No. 10.

these WOOLERY machines *speed* maintenance work and *cut* costs

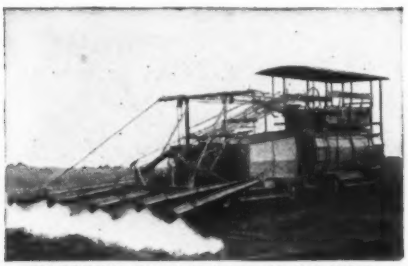
On thousands of miles of busy roadbeds WOOLERY machines are in use on routine maintenance work at all seasons of the year. For weed eradication, snow clearance, tie cutting, or tie plate spacing, WOOLERY Maintenance Equipment takes over the labor of the job with mechanized efficiency, producing uniform results with reliable speed and economy.

1. WOOLERY Tie Cutter

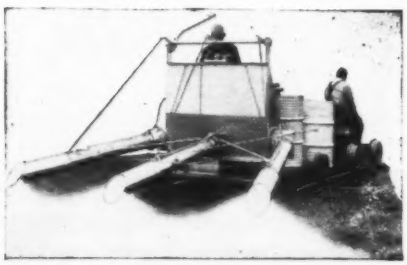
The WOOLERY Tie Cutter and Undercarriage enables one man to quickly cut each worn tie into three easily-removable pieces which can be lifted out without disturbing the ballast, so that new ties can be reseated on a firm bed. With this modern machine the entire cutting operation is performed without lifting or turning, by traveling the cutting mechanism across the undercarriage to cut both ends of the same tie, and rolling the whole apparatus along the rails to successive tie positions. Total cutting time per tie is less than two minutes.

2. WOOLERY Weed Burners

WOOLERY Giant Octopus Model WBZ Weed Burner will destroy a swath of weeds 25 feet wide in one trip or up to 35 feet with burner arms extended on second run. Other WOOLERY Weed Burners are made in 1-burner and 3-burner models. Weed burners can be operated in winter as snow melters.



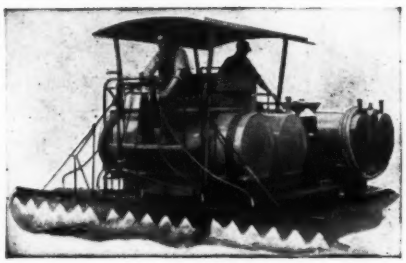
WOOLERY Giant Octopus Model WBZ Weed Burner



WOOLERY MODEL PBB Weed Burner

3. WOOLERY Chemical Sprayer

A dual-purpose machine which may be used as a chemical sprayer or weed burner; especially useful for killing weeds near buildings or in areas where open flames would be too hazardous. Chemical sprayer is 18 feet wide. Burner unit covers 15-foot swath first trip, up to 25-foot swath second trip.

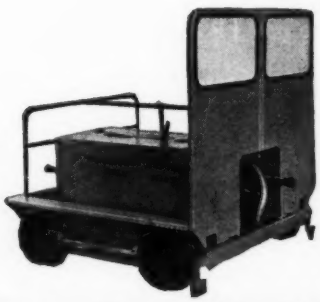


4. WOOLERY Tie Plate Spacer

WOOLERY Tie Plate Spacer quickly and accurately locates single or double shoulder plates at exact position on ties. Light in weight so that one man can easily handle it on or off track.

5. WOOLERY Motor Car

WOOLERY No. 300 Motor Car gives advantages of a light car with heavy-duty performance and greater pulling power. Four-wheel drive, with differential when needed; two speeds forward, two reverse. Light enough for one man to lift on or off at crossings; large enough to carry eight men and track tools.



WOOLERY MACHINE COMPANY

MINNEAPOLIS MINNESOTA

Pioneer Manufacturers of RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS • MOTOR CARS • FLANGEWAY CLEANERS • TIE CUTTERS • TIE PLATE SPACERS • RAIL JOINT OILERS • CREOSOTE SPRAYERS

EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., NEW YORK, N. Y.

SIMPLICITY for ease of operation

...with the safety of Certain operation

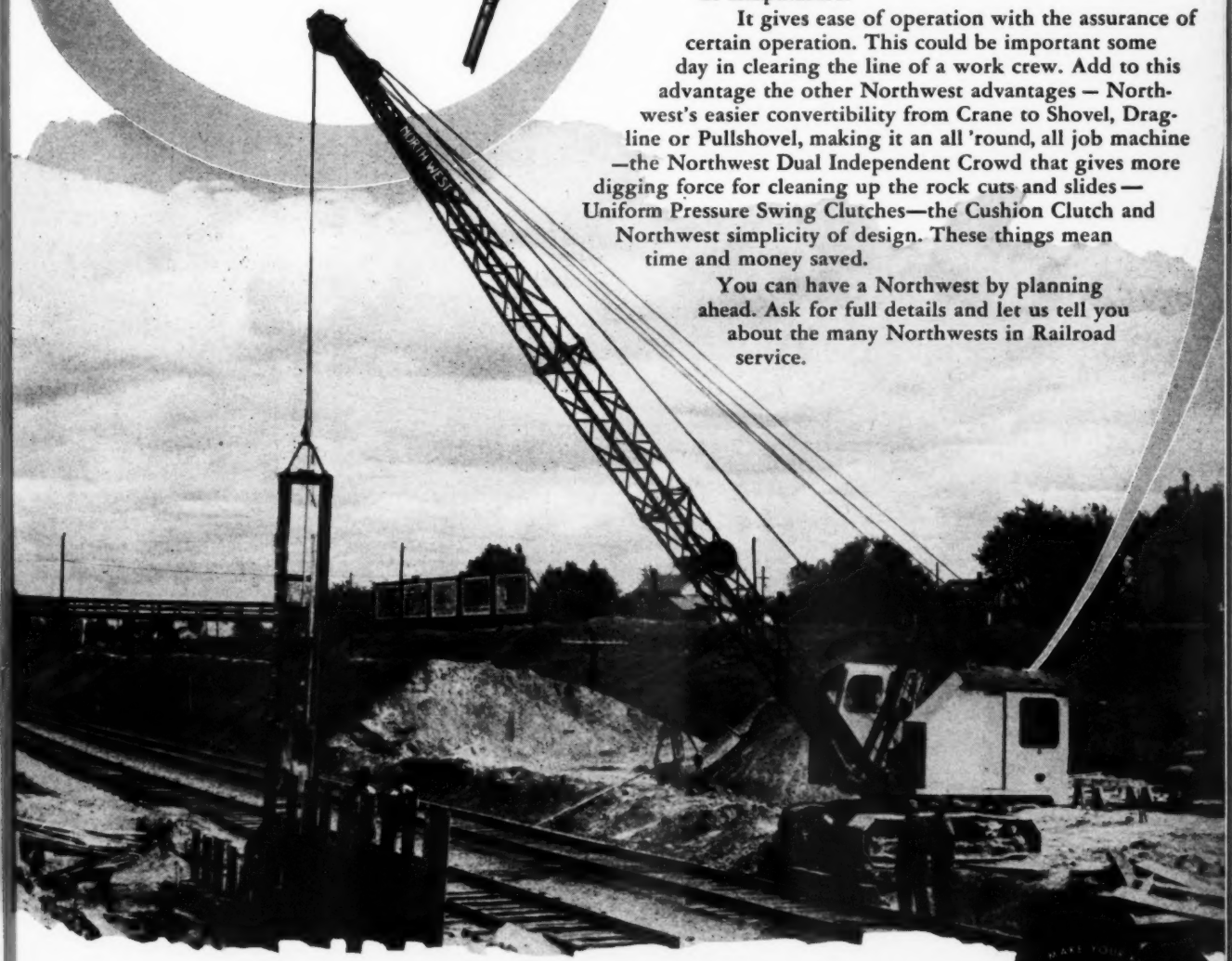
The "Feather-Touch" Clutch Control utilizes the power of the engine to throw heavy drum clutches. This is all there is to the device. Compare this with the complications being offered on other similar equipment.

WHEN your operators get on a Northwest out on the line you know it is going to work. Your Northwest will never be shut down because of control failure.

The "Feather-Touch" Clutch Control is a simple mechanical device—a drum, a band, and a toggle mechanism. No tubing winding around the machine, no valves, no pumps, nothing to fill, nothing to leak out, and it is unaffected by weather or temperature.

It gives ease of operation with the assurance of certain operation. This could be important some day in clearing the line of a work crew. Add to this advantage the other Northwest advantages — Northwest's easier convertibility from Crane to Shovel, Dragline or Pullshovel, making it an all 'round, all job machine —the Northwest Dual Independent Crowd that gives more digging force for cleaning up the rock cuts and slides — Uniform Pressure Swing Clutches—the Cushion Clutch and Northwest simplicity of design. These things mean time and money saved.

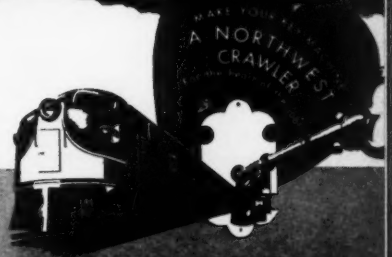
You can have a Northwest by planning ahead. Ask for full details and let us tell you about the many Northwests in Railroad service.



NORTHWEST ENGINEERING COMPANY
1513 Field Building, 135 South LaSalle Street, Chicago 3, Illinois

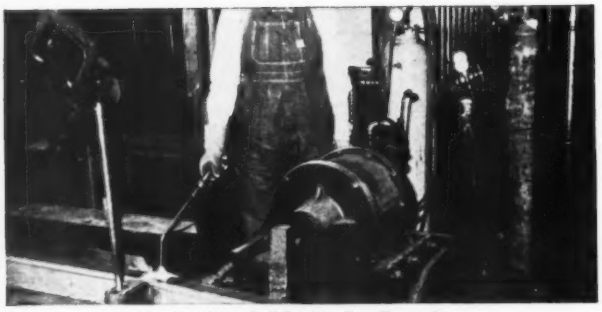
NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL

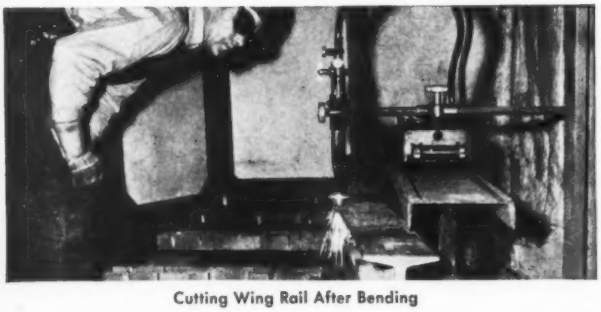


WHAT'S THE BEST WAY

...to fabricate rigid frogs?

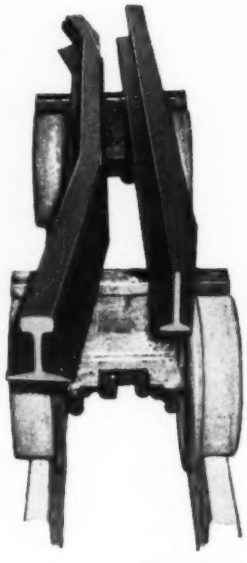


Heating Wing Rail for Bending Operation



Cutting Wing Rail After Bending

Cutting Long Point Rail



Both Rails After Bending, Cutting and Finishing

Use the Oxyacetylene flame processes!

Airco Railroad Service Representatives recently supervised the fabrication of rigid frogs in a large railroad shop. They observed costs and results. On the basis of this experience, they recommend:

For Bending – heat both the wing rail and the long point rail in required places with the oxyacetylene flame. This simplifies the actual bending operation – cuts time and cost.

For Cutting – make the two cuts on ball and the two on the base of long point rail with the Airco No. 10 Radiagraph (portable, oxyacetylene gas cutting machine) and using the same machine make the necessary cut on the wing rail.

This type of cutting operation was found to be far more economical and less time consuming than doing the same job by other means.

For more information about the above job and other oxyacetylene flame or arc welding applications, write your nearest Airco office.

Costs Come Down Under The Airco Plan

AIRCO **AIR REDUCTION**

Offices in Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases... Carbide... Gas Cutting Machines... Gas Welding Apparatus and Supplies... Arc Welders, Electrodes and Accessories

Double-duty crane does it on the double with TIMKEN® bearings

THIS unique mobile swing boom crane is built to operate either on the tracks or on the ground, and work anywhere in the yard, warehouse or shop. It's equipped with 26 Timken® tapered roller bearings to keep it on the go and working smoothly under any load.

Timken bearings have extra load carrying capacity due to the line contact between the rollers and races. And the true rolling motion and incredibly smooth surface finish of Timken bearings enable them to operate freely, frictionlessly. Because of their tapered construction, Timken bearings carry any combination of radial and thrust loads. Gears and shafts are held in positive alignment, minimizing wear.

Timken bearings permit tighter lubricant-retaining closures that keep out damaging dirt and moisture. Maintenance costs are kept to a minimum. Carburized, case-hardened rollers and races with tough, shock-resisting inner cores give Timken bearings extra strength and durability under the heaviest loads. Timken bearings last the life of the machine under normal conditions because they are 1) made of Timken fine alloy steel, 2) precision manufactured, and 3) engineered for the job.

Backed by 50 years of bearing research and development, Timken tapered roller bearings are industry's No. 1 choice. No other bearing can give you *all* the advantages you get with Timken bearings. Make sure the trade-mark "Timken" is on the bearings of every machine you build or buy. It's your insurance of long, trouble-free performance. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian Plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

SILENT HOIST & CRANE CO. *uses Timken tapered roller bearings in the wheels, kingpin, steering column, pinion and differential to keep this double-duty Rail-O-Road Krane Kar always on the job.*

WE MAKE OUR OWN STEEL

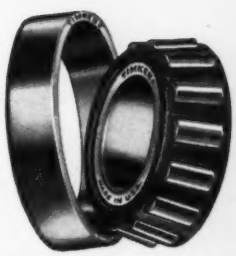
The special grade alloy steel which gives Timken bearings their strength and resistance to wear, is made in our own steel mills.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

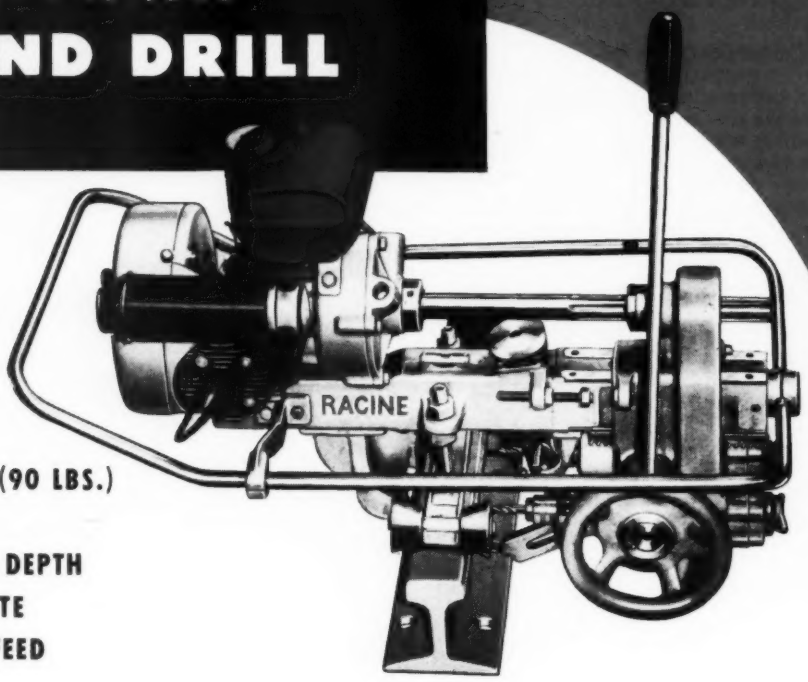
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION ✳

YOUR **EXTRA EMPLOYEE** THAT WORKS WITHOUT PAY

RACINE *Portable* BOND DRILL



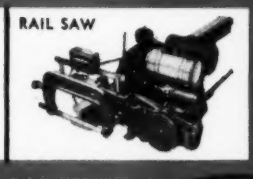
- LIGHT IN WEIGHT (90 LBS.)
- TWIN SPINDLES
- CONTROLLED HOLE DEPTH
- FAST AND ACCURATE
- LEVER AND RACK FEED

A RACINE gas engine powered Portable Bond Drill does the work of several men. It frees man power for other jobs. An "extra employee" in every way but pay.

The RACINE Bond Drill is actually a rugged, accurate drill press built on horizontal lines. Readily rolled along or lifted by one man. Quickly clamped in position for drilling straight round holes. Easily removed to clear the track for traffic.

An adjustable gauge sets depth of drilling. Lever and rack feed enable the operator to maintain steady hole production, effortlessly. Simple, fast and accurate, this machine helps you to meet today's demand for more work — with less men — at lower cost. Write for complete 3-color catalog.

OTHER PORTABLE MACHINES BY RACINE



RACINE TOOL AND MACHINE COMPANY
1738 State Street • Racine, Wis.

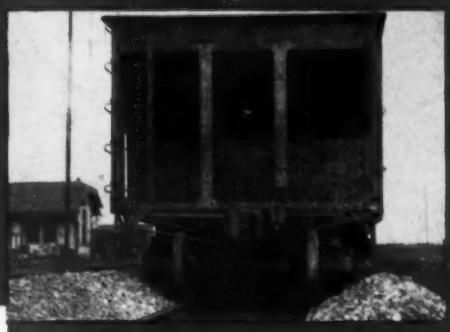
STANDARD FOR QUALITY AND PRECISION · RACINE · RACINE TOOL and MACHINE CO.

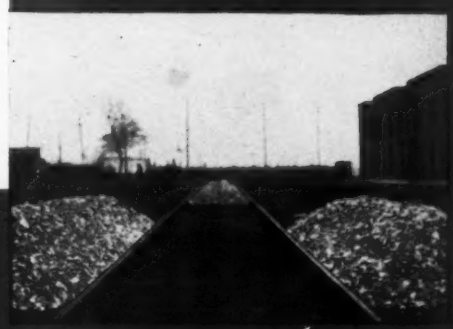
ENTERPRISE

MULTI-SERVICE BALLAST CAR

Convenient operation at center and ends of car controls ballast discharge

the Choice
OF MANY RAILROADS





CHECK THESE OBVIOUS ADVANTAGES

Deposits ballast in place and quantity desired.
100% discharge.
Easy, one-man operation.
All ballast deposited clear of rails.
Reduces time, labor, and cost of ballasting.

50-ton and 70-ton Enterprise Multi-Service Ballast Cars may be built by any car builder, the door operating mechanism being furnished by Enterprise Railway Equipment Company as a specialty.

A SIDE DISCHARGE CAR — A CENTER DISCHARGE CAR OPERATIVE EITHER OR BOTH SIDES SIMULTANEOUSLY

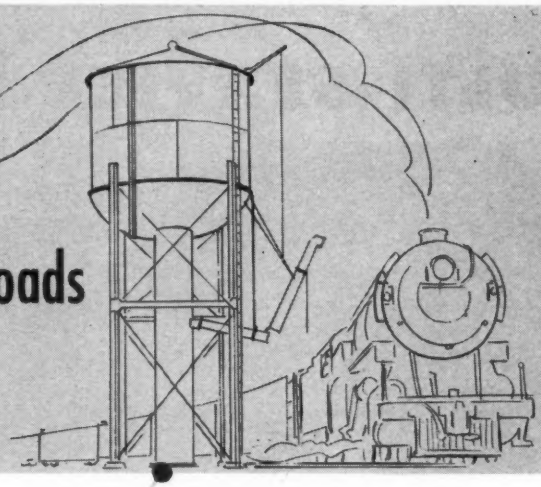
ENTERPRISE RAILWAY EQUIPMENT COMPANY

89 East Van Buren Street · Chicago 5, Illinois

SINCE 1905

America's Leading Railroads

specify

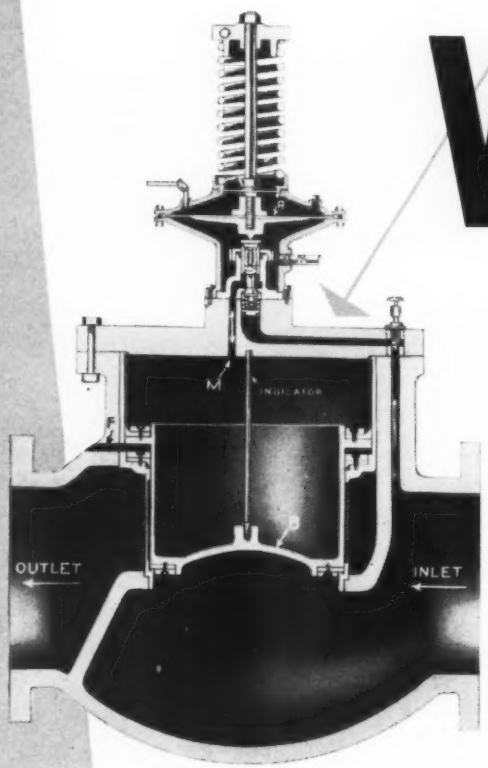


GA

cushioned

ALTITUDE

VALVES



Golden-Anderson Cushioned Altitude Valves have proven efficiency and performance records on elevated tanks of the main railroads of America. These valves maintain a uniform water level and can additionally be arranged to automatically function pumps, electrical devices or signal lights. The air and water cushioning in all Golden-Anderson valves prevents any shock or hammer and permits valve to operate smoothly at all times. *Write for technical data.*

GOLDEN-ANDERSON *Valve* **SPECIALTY CO.**

2078 Keenan Building **Pittsburgh 22, Pa.**

LIFE AND PROPERTY PROTECTION

VALVES SINCE 1905

"X" MARKS THE SPOT for MECHANIZATION with NORDBERG MACHINES

EACH "X" marks a spot where specific rail laying and reballasting jobs can be handled faster, more efficiently, with Nordberg Track Maintenance Machines. Starting with the removal of old spikes . . . right on through final operations in laying of new rail and ballast reconditioning . . . each Nordberg Machine is designed to handle its job with speed and accuracy.

Mechanization with Nordberg Machines is the answer to costly, time-consuming maintenance operations. It will pay you to investigate how you can accomplish more with the time and labor saving advantages of Nordberg Machinery.

Write for descriptive bulletins on any or all of the equipment shown here.

SPIKE PULLERS . . . Fast spike pulling by machine speeds up re-laying and reduces the cost of the entire operation.

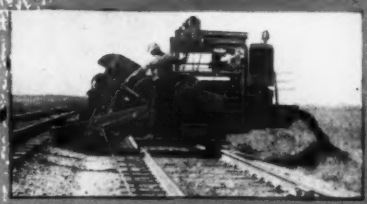
POWER TRACK WRENCH . . . All bolts in old rail quickly removed with power wrench.

ADZING MACHINES . . . provide tie seats keeping with day's maintenance standards —all level and in same plane.

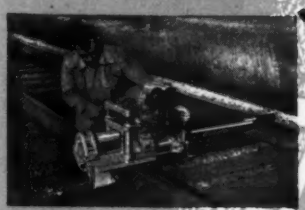
NORDBERG GAGING TEAM . . . consists of one man operating TRAKGAGER, one man on the SPIKE HAMMER and two men with SPIKE HOLDERS doing the gage spiking.

CRIBEX . . . removes material contained in the cribs and deposits it beyond the ends of the ties.

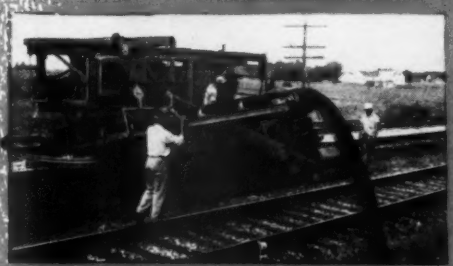
SPIKE HAMMERS . . . At this point Nordberg Spike Hammers take over for fast, accurate driving of new spikes.



BALLASTEX . . . excavates the ballast in area between tracks or in shoulder. Disposes of it by wasting or by feeding to SCREENEX for cleaning.



RAIL DRILLS . . . for high-speed drilling of bolt holes in closure cuts. Light weight, easily handled by one man.



SCREENEX . . . takes excavated fouled ballast fed by BALLASTEX, cleans material and returns it to track, intertrack, or shoulder.

Look to **NORDBERG**

NORDBERG MFG. CO., Milwaukee 7, Wisconsin

. . . for continually improved TRACK MAINTENANCE MACHINERY *to do a Better, Faster Maintenance Job at Lower Cost*

PLAN NOW . . . . for your 1951 "growing season."

Reliable Herbicides for . . .

ROADBED
RIGHT-OF-WAY

. . . from Recognized Research

* TCA - CHLORATE
CHLORATE - CHLORIDE
SODIUM ARSENITE
BRUSH KILLER

* Pat. Pending

✣

Complete Weed Killer Service

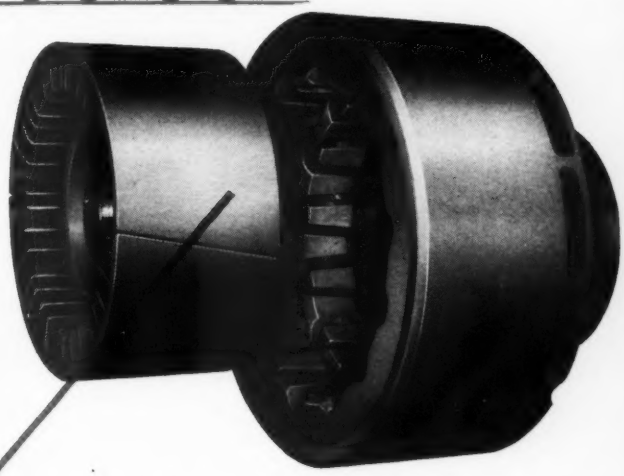
The R. H. BOGLE COMPANY

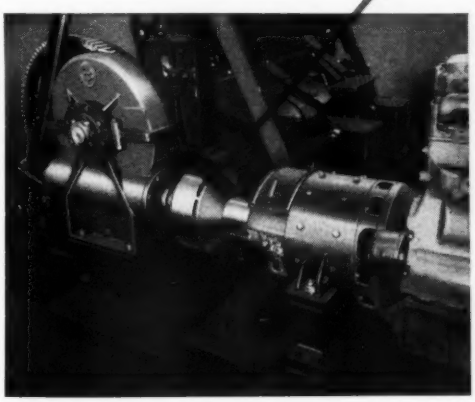
ALEXANDRIA, VIRGINIA

ATLANTA, GA. **MEMPHIS, TENN.**

NOW AVAILABLE ON **BROWNHOIST** LOCOMOTIVE CRANES . . .

new dyna-matic clutch





For Smooth, Acceleration, and Control of Hoist, Rotating and Travel

The new, electrically operated DYNAMATIC CLUTCH, available only on Brownhoist locomotive cranes, provides a smooth, responsive flow of power never before possible with the usual disc or mechanical clutch for transmitting power to the machinery of a crane. The DYNAMATIC CLUTCH is essentially a driven rotor revolving on anti-friction bearings within a rotating coil energized by a small flow of current from the starting battery. The new DYNAMATIC CLUTCH has a 32-step control. Power response is steady and sensitive. Loads may be raised, lowered, or rotated smoothly and accurately without the use of mechanical brakes. Torsional impulse and vibration from the power source is completely eliminated. The DYNAMATIC CLUTCH provides a cushion between the engine and crane machinery. When clutch is fully engaged there is no appreciable slippage. Since there is no contact between the revolving field and armature, there is no friction between moving parts nor drag between the parts when the controller is in the off position — no parts need replacement other than inexpensive brushes. The new DYNAMATIC CLUTCH is one more good reason it pays to buy a BROWNHOIST.

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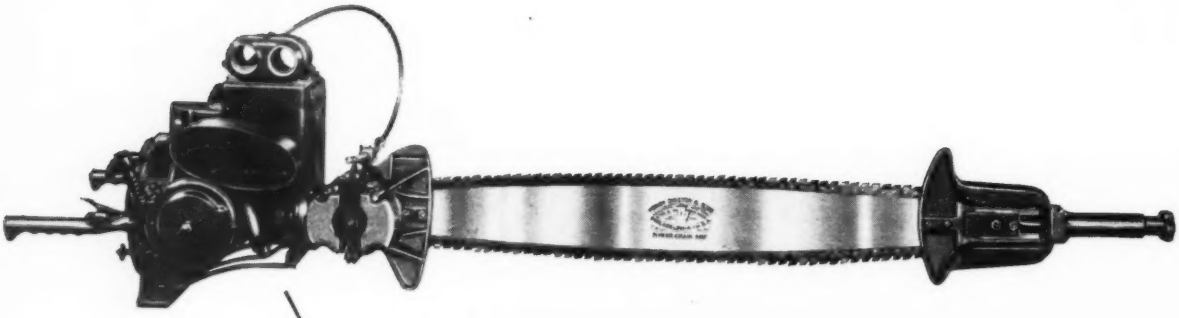
BROWNHOIST

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, San Francisco, Chicago, Canadian Brownhoist Ltd., Montreal, Quebec. **AGENCIES:** Detroit, Birmingham, Houston, Los Angeles, Portland, Seattle, Spokane.



DISSTON® CHAIN SAWS

CAN SAVE YOU MONEY

This BIG 36-page Book
TELLS YOU HOW

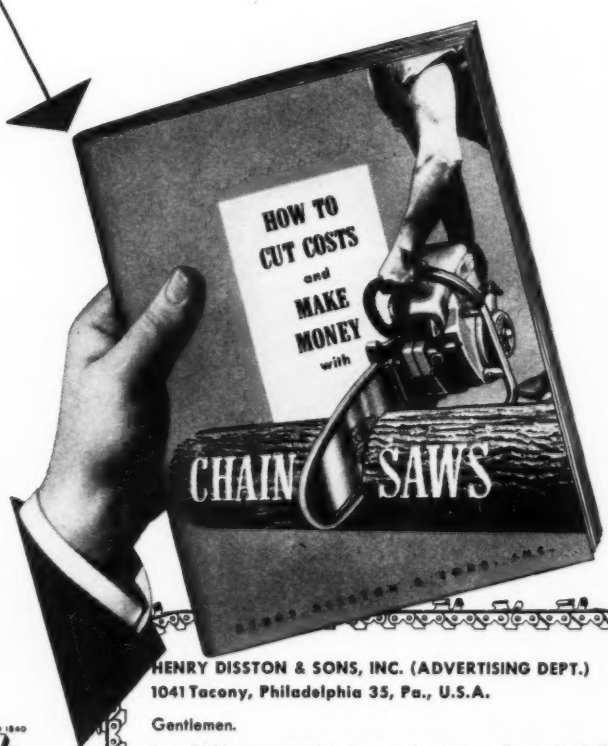
...TO BUY

...TO USE

...TO PROFIT

from

CHAIN SAWS



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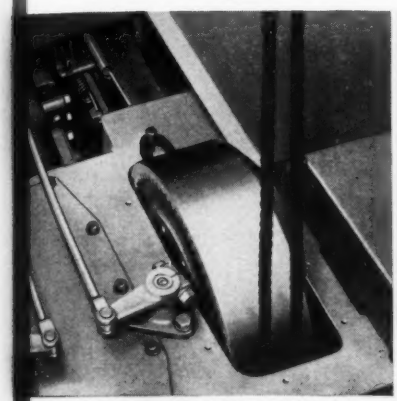
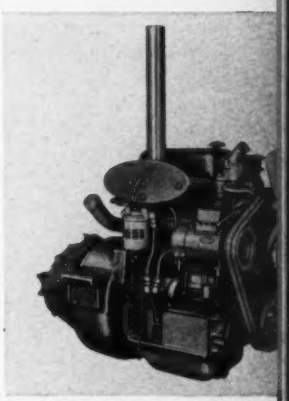


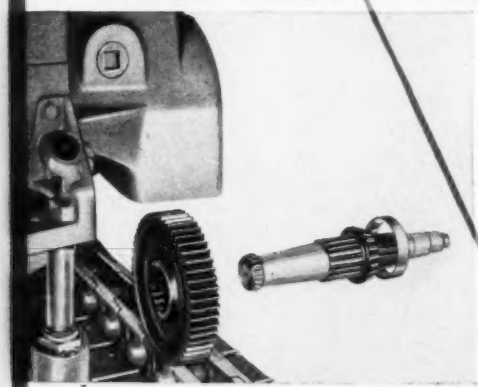
Each steering clutch can be removed independently and without removing final drive pinion or bevel gear.

Transmission can be removed as a complete unit without removing clutch, final drive or bevel gear.

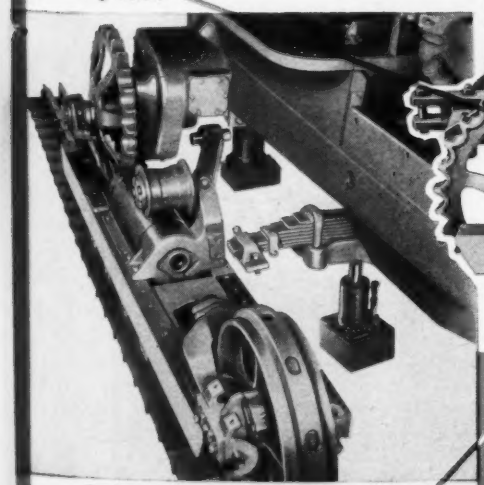
Clutch assembly can be removed without disturbing engine or transmission.



Engine can be removed disassembling clutch.



Final drive gear and intermediate gear can be removed without disturbing steering clutch.



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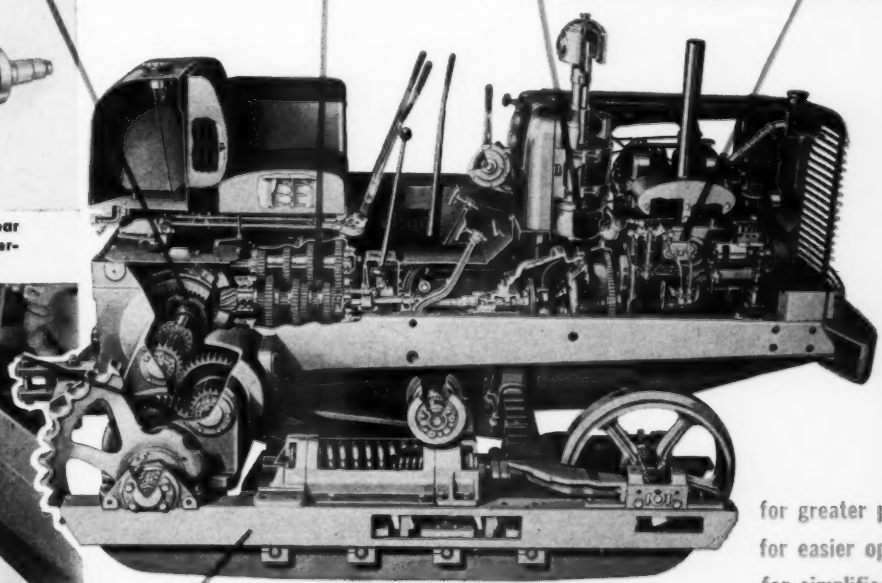

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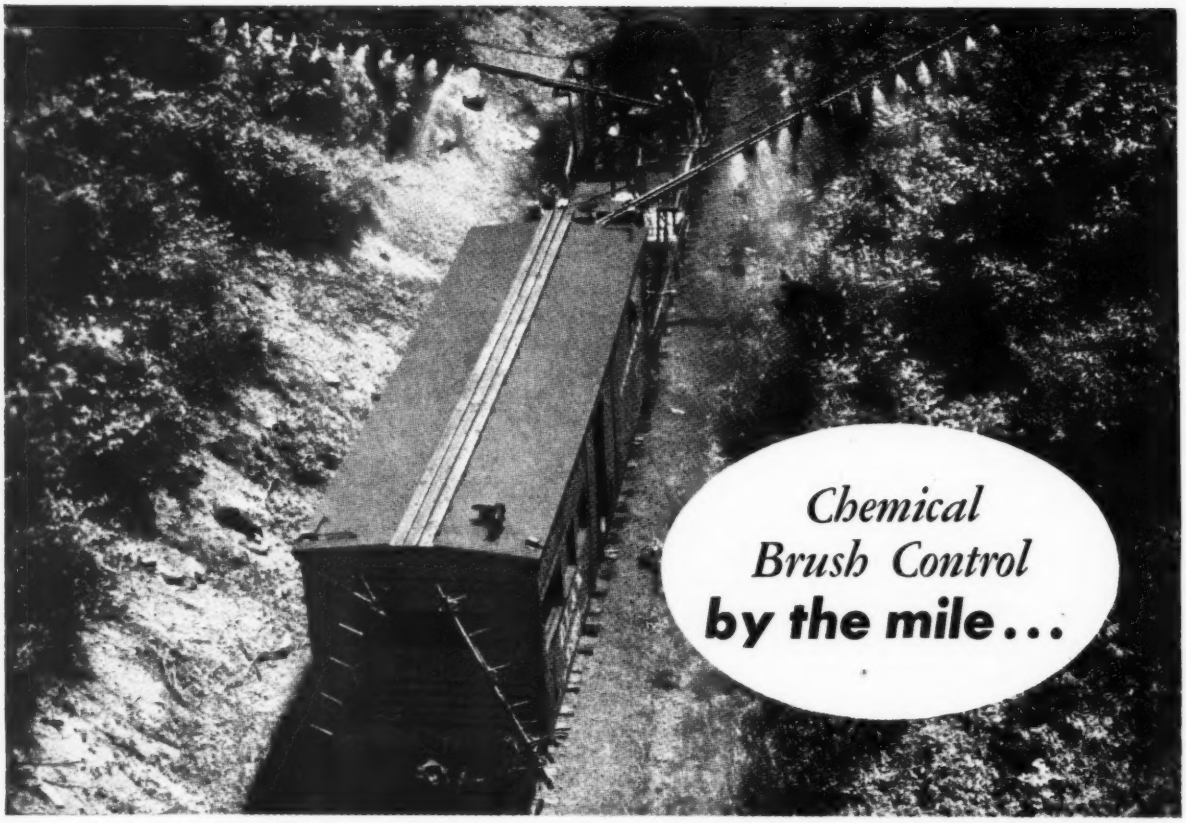

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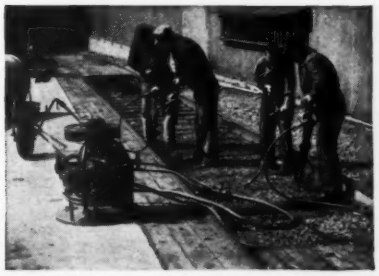

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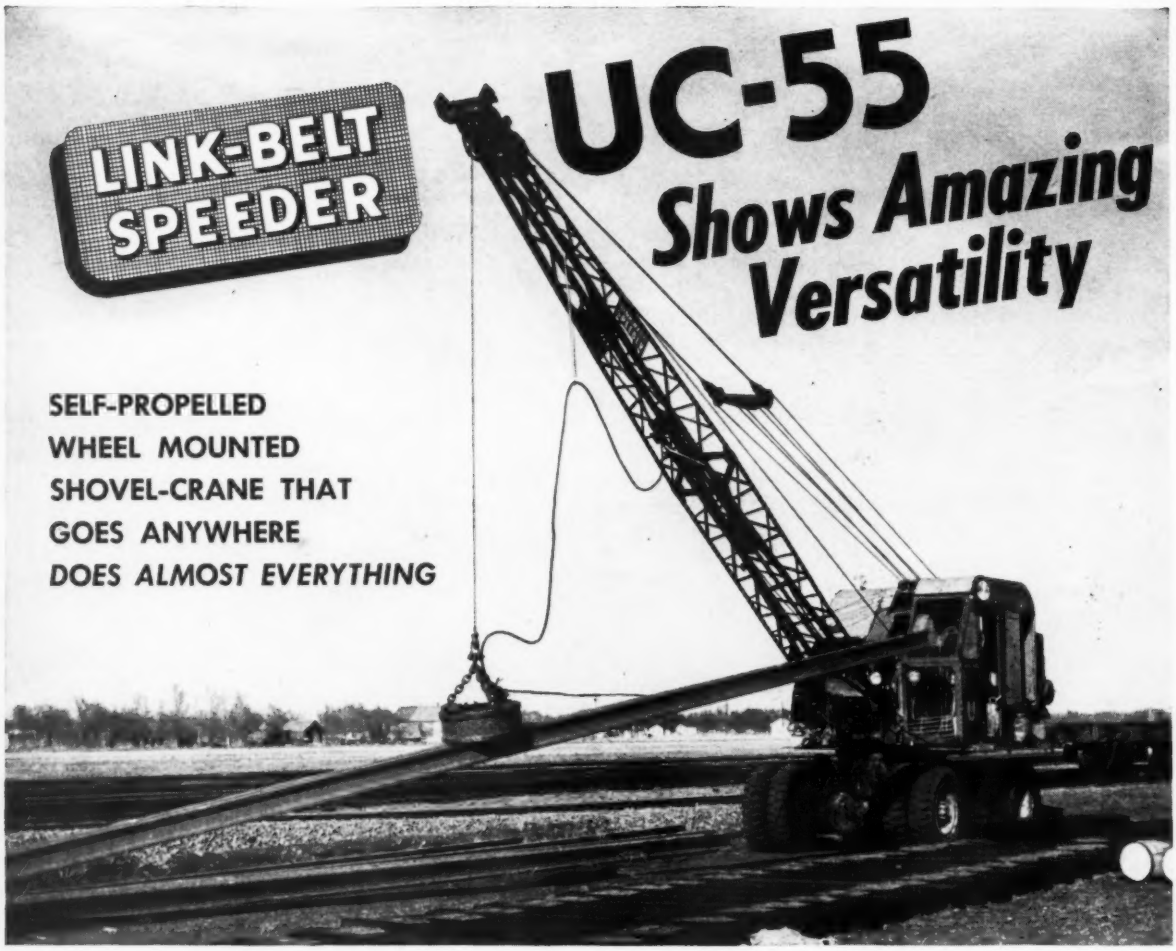

TYPICAL JOBS HANDLED DURING 2-YEAR PERIOD BY THIS HIGHLY MANEUVERABLE CONVERTIBLE SHOVEL-CRANE

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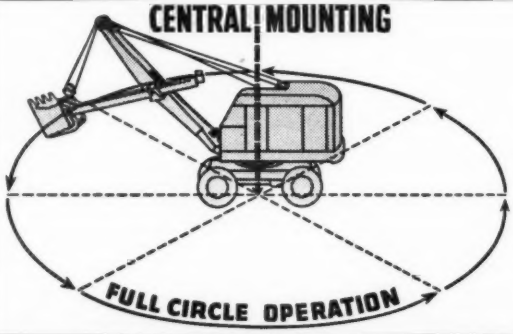
The number and variety of jobs that are done by the Link-Belt Speeder UC-55 are continually increasing, as reports come in from users, in industry, the utilities and construction companies. Highly mobile and self-propelled, it gets from job to job in a hurry; a complete Link-Belt Speeder unit, it brings ample power, speed and ease of handling to every operation. The nearby Link-Belt Speeder distributor will gladly furnish details.



Central mounting of the UC-55 upper machinery is an outstanding feature, which permits fast shovel operation over the sides or ends.

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Below is a complete index of the products referred to in both the editorial and advertising pages of this issue. If you desire additional information on any of them, use one of the accompanying addressed and stamped postcards in requesting it. In each case give name of product and page number. The information will come to you directly from the manufacturer involved, without any obligation on your part.

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Here's just one "case history" from Model 10's unparalleled safety record. In June 1936 two Model 10 crossing signals were installed by the Grand Trunk Western Railroad in Harvey, Illinois. In the preceding 5 years there had been 14 deaths at this crossing. Since Model 10 installation there have been no accidents of any kind.

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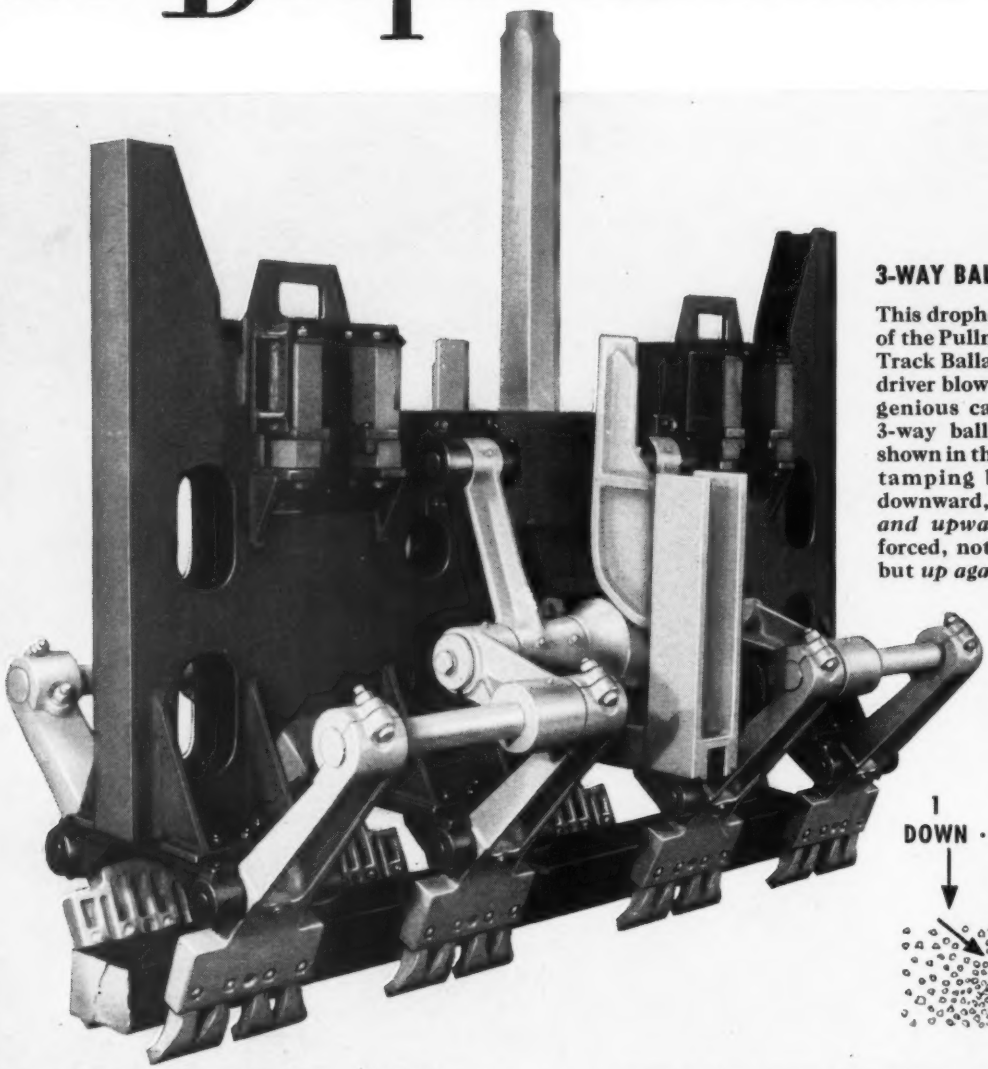
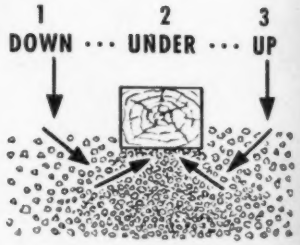


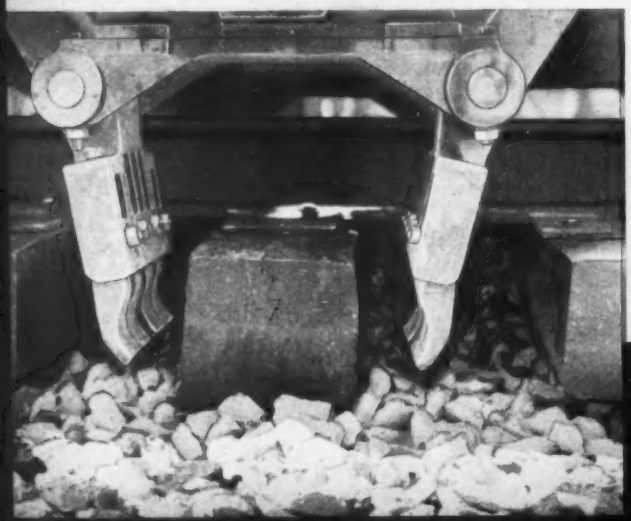
3-WAY BALLAST COMPACTING

This drophead assembly—heart of the Pullman-Standard Power Track Ballaster—delivers a pile-driver blow every 2 seconds. Ingenious cam action produces 3-way ballast compacting. As shown in the diagram below, the tamping blows are directed downward, *then turned inward and upward*. The ballast is forced, not only *under* the tie, but *up against its base*.

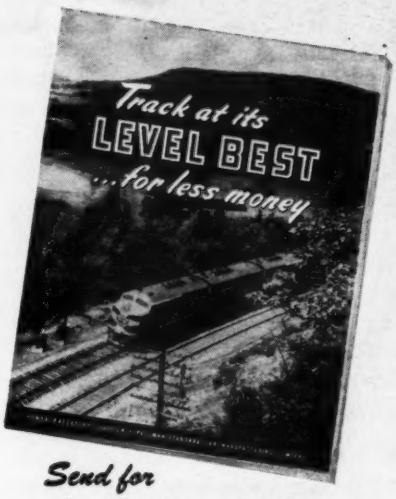


● Different types of tamping bars, quickly interchangeable, make the Ballaster a highly versatile machine. In fine ballast, it can be a power-shovel tamper; in coarse ballast, a power-fork or pick tamper.

● Only when more ballast is needed . . . and *always* when needed . . . these feeding forks snap the ballast inward, their movements coordinated with the drophead's action. Their operation is completely automatic.



work of 48* men!



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Write for your personal copy of this 24-page brochure which gives the complete story of Pullman-Standard Power Track Maintenance equipment . . . the Power Cribber, the Ballast Cleaner and the Power Ballaster.

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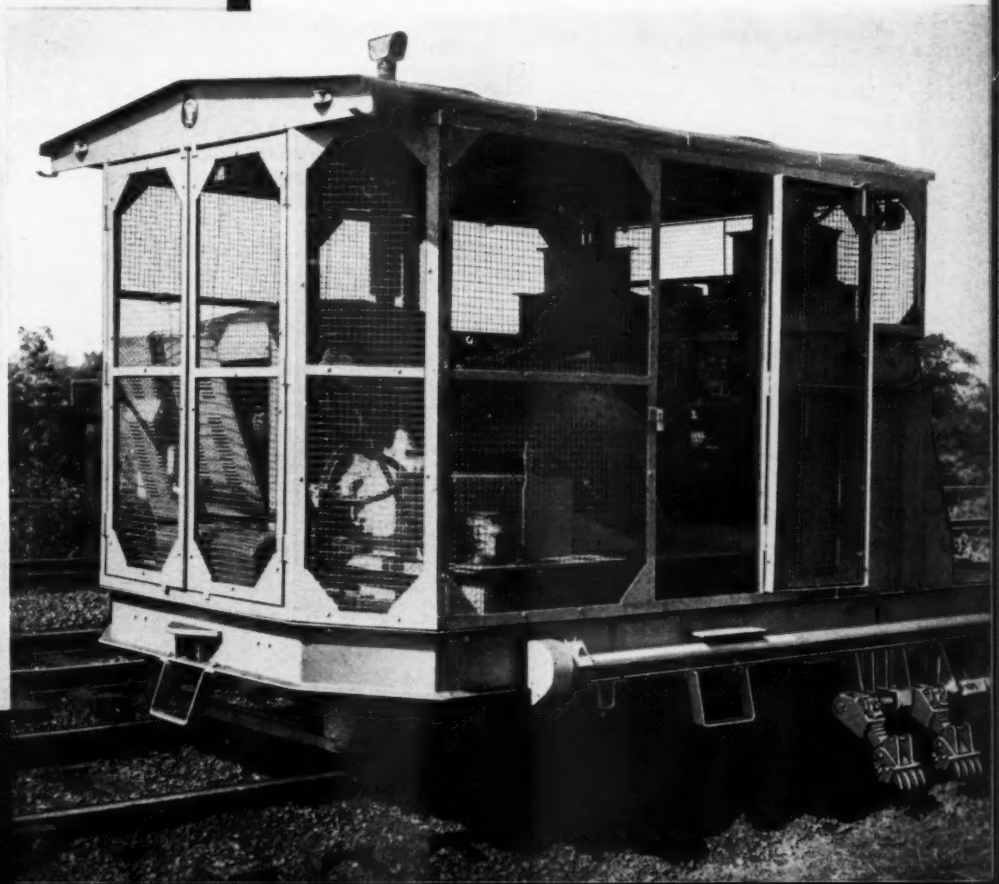

**This is a conservative figure based on a track-raising operation organized to permit continuous machine operation during the time the track is available.*

CONCRETE pile and slab trestles give high load capacity, low maintenance

Above photo shows reinforced concrete piles being driven on 622-ft. trestle spanning the South Slough of the Altamaha River south of Savannah, Ga. Templets at deck and ground levels used to insure proper alignment of the piles.

●

Lower photo shows precast concrete piles awaiting installation along old trestle. Special construction track minimized loss of time in clearing for passing trains.

IN 1947 the Seaboard Air Line Railroad began a trestle replacement program on its high-density traffic lines. This program was necessary because existing timber structures were reaching the end of their useful life and maintaining them was costly.

To assure long life, low maintenance and high load-carrying capacity, Seaboard engineers chose concrete pile and slab construction. To date four precast concrete pile and slab trestles—totaling 3,415 linear feet—have been completed.

For all but the first installation three-pile bents were used, every fifth being an anchor bent of six piles in two rows. The octagonal piles are 20 in. in diameter and 30 to 50 ft. long.

Many other American railroads have found that concrete piles are ideal for bridge replacement because they provide:

- **ECONOMY.** Concrete pile and slab trestles can be built at low cost per ton of load capacity. Maintenance is reduced to a minimum.
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Armco STEELOX Buildings have all the advantages of any other permanent structure. Yet they can be quickly rearranged or dismantled and reassembled on a new site without loss of material. Even after several moves they remain rigid and weathertight. The patented joints can't open up or pull apart.

Try STEELOX construction the next time you need motor car garages, offices, bunk houses, and similar railroad structures. You'll save time and money. Write us for prices and complete information. Armco Drainage & Metal Products, Inc., 5190 Curtis St., Middletown, Ohio. Subsidiary of Armco Steel Corporation.

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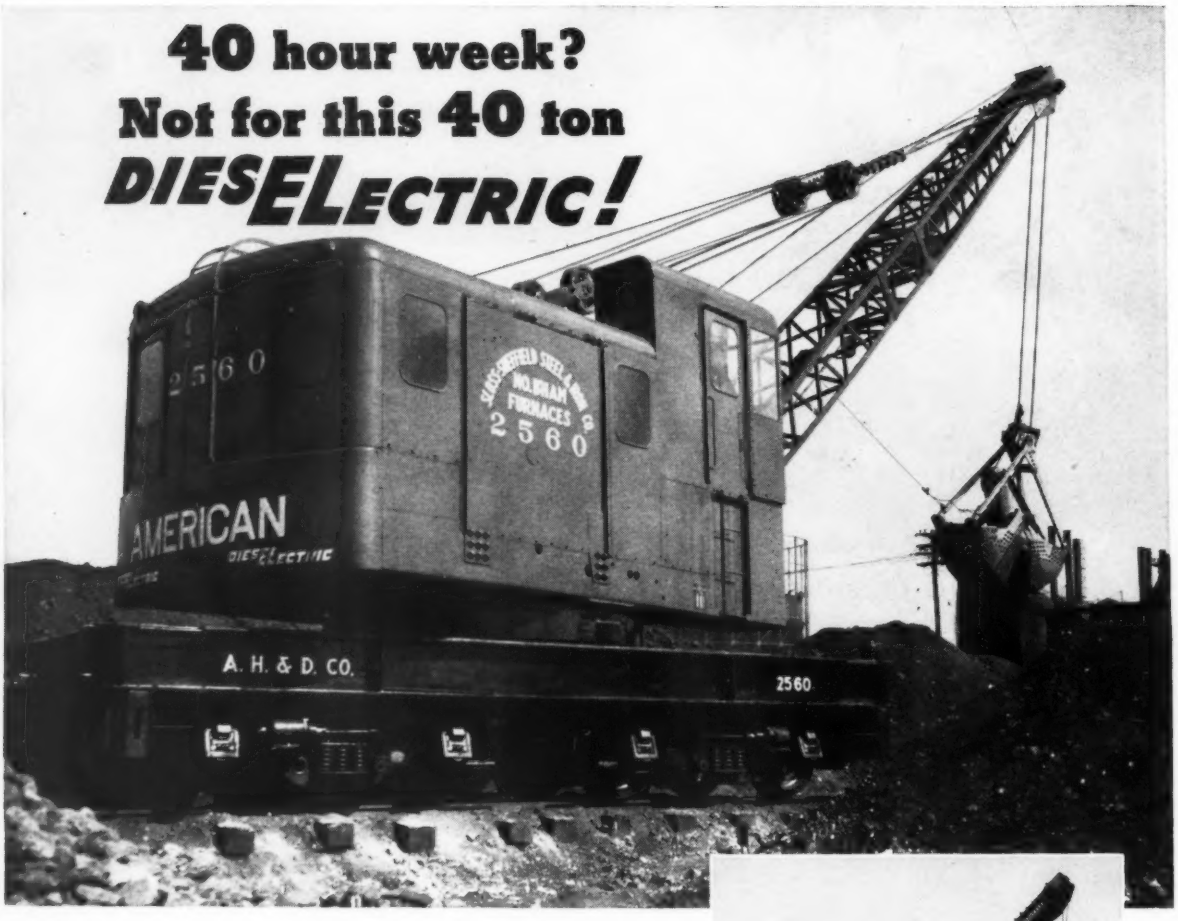
DIESELECTRIC!



BUCKET, MAGNET, HOOK OR GRAPPLE . . . all operated with ease from AMERICAN's conveniently banked control panel. The DiesELectric Locomotive Crane is manufactured under Patent No. 2083460. Touch Control Patent No. 2370856.

Here's a crane that will work non-stop for 168 hours a week if you want—week after week after week. No coal stops, no boiler cleanouts, no water stops, no long and costly shutdowns for overhaul. It's the 40 ton AMERICAN DiesELectric!

These smooth working DiesELectrics are doing a wide variety of jobs, handling coal, scrap and other materials. They pay for themselves by tremendous work output and a remarkable reduction of upkeep expense.

Maintenance savings of up to 50% are the result of patented DiesELectric design, using electric traction power to the trucks, diesel power to the crane deck. This design eliminates seven tons of wearing parts from the underbody, cutting down-time, labor and shop repair to a point where these savings will equal the entire cost of the crane in five years. Want to find out what a new AMERICAN DiesELectric could do for you? Mail the coupon below, for literature.

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American Hoist & Derrick Company
St. Paul 1, Minnesota 31 5613

● Please send information on DiesELectric Locomotive Crane, capacity_____tons.

Name_____

Company_____

Address_____

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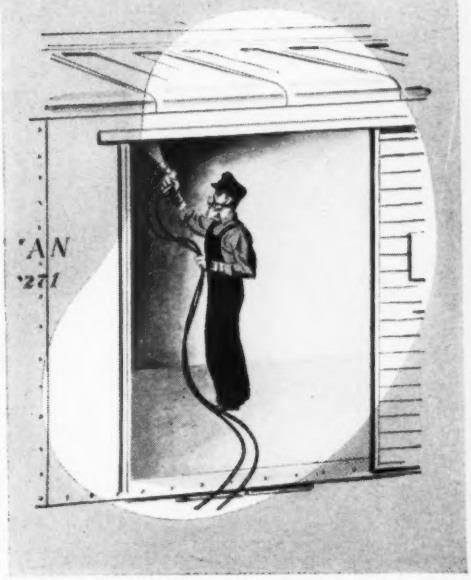
St. Paul 1, Minnesota

Plant No. 2: SO. KEARNY, N.J.
Sales Offices: NEW YORK • PITTSBURGH • CHICAGO

PROTECT YOUR ROLLING STOCK

Inside and Out WITH FLINTKOTE RAILROAD PRODUCTS

Get the Made-to-Order Dependability that these specialized products bring to every job they do for you.

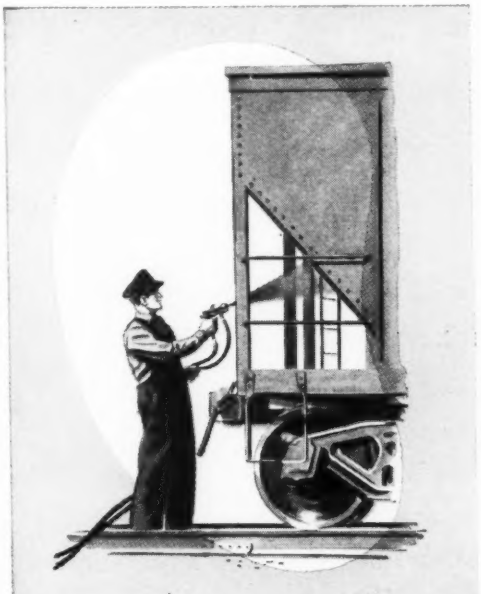


IF YOU WANT THE *INSIDE* STORY . . .get the facts on Flintkote Insulation Coatings.

Freight cars, like homes or warehouses, need thermal insulation and sure protection against condensation. Moisture on bare structural metal invites corrosion . . . condensation drip on products and equipment causes heavy losses.

Load a cold car with warm products . . . like flour, sugar, corn starch . . . haul East and West, North and South, mountains to the sea for weather extremes . . . unless you have proper protection, condensation brings trouble.

Flintkote Insulation Coatings will serve you well and meet every shop requirement on application. Cutback types for quick drying protection and easy sprayability . . . non-inflammable emulsion types in both summer and winter grades eliminate application hazards and give anti-sweat performance. All are "tops" in protection against corrosion.



FOR *OUTSIDE* JOBS . . . on frames, under floors and roofs, on slope and end sheets . . . protect your rolling stock with Flintkote Car Cements. These specialized products are highly resistant to water, flying cinders and gravel, resist cracking under temperature changes and they give long-life protection against corrosion . . . Flintkote standard grade or special types formulated to your own specifications.

FLINTKOTE LINE OF RAILROAD PRODUCTS

We'll be glad to send you complete specifications and application data on Asphalt Emulsion Protective Coatings...Car Cements...Insulation and Anti-condensation Coatings...Cold-laid Asphalt Mastic Flooring...Building Materials . . . Materials for control of water and dampness problems.

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FLINTKOTE *Products for Industry*

FLINTKOTE INDUSTRIAL PRODUCTS

Here's how to eliminate "Frozen Joints"

1. Use the oxy-acetylene flame to loosen mill scale, and drive out moisture from around the joint area.

2. Next wire-brush the area to remove the loose scale.

3. Then paint the area with a good lubricant.

Now, these clean joint areas—free of troublesome mill scale—will discourage joint bars from "freezing to the rail" and will require less maintenance.

This operation takes a little over a minute to do, and will fit right into your present rail-laying program. Ask OXWELD for more information about how you can use flame-cleaning to prevent joint bars from freezing to rail ends when you lay new rail.

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THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
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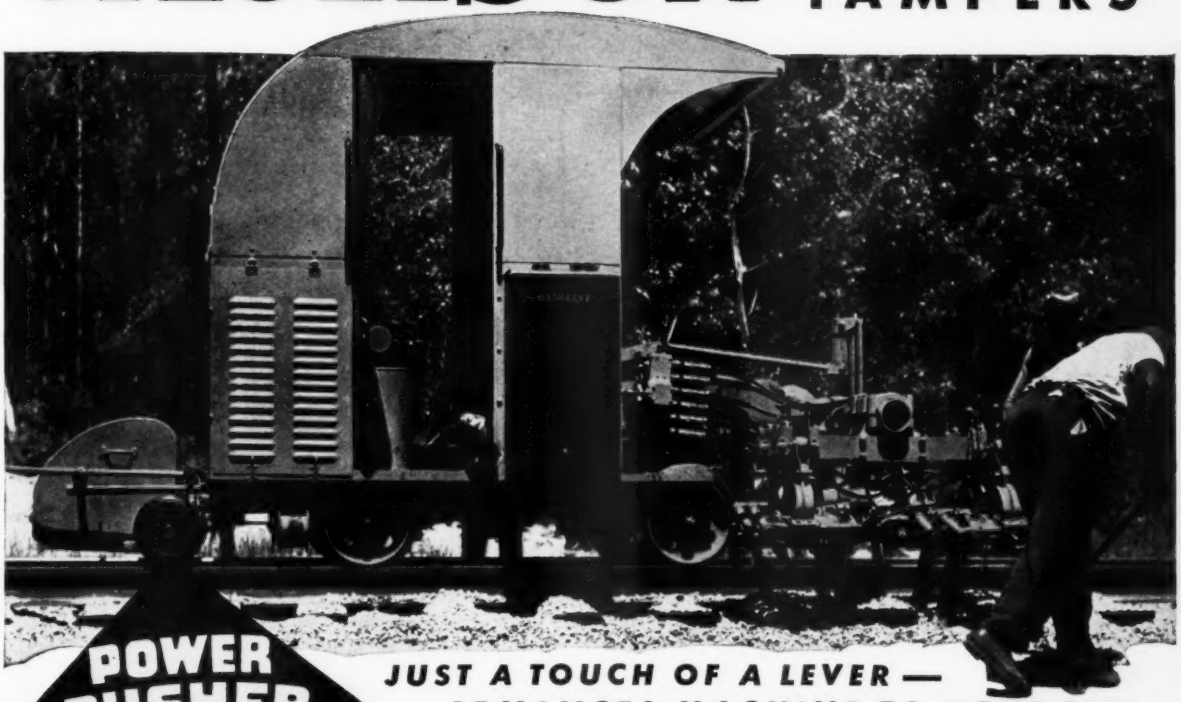
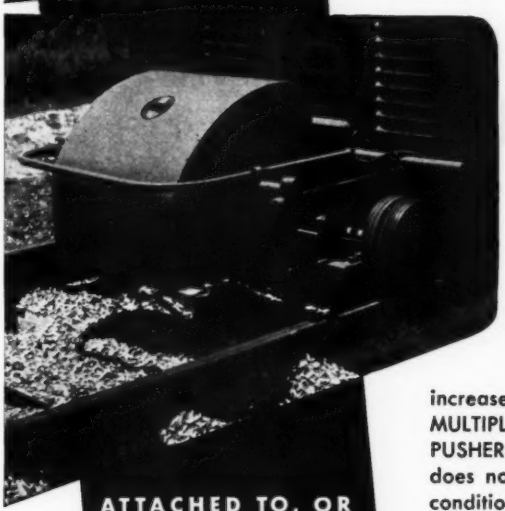
Canadian Railroad Service Company, Limited, Toronto

SINCE 1912 THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

Now available for all JACKSON MULTIPLE TAMPERS



POWER PUSHER



ATTACHED TO, OR DETACHED FROM OLD OR NEW MODELS IN A MATTER OF SECONDS!

JUST A TOUCH OF A LEVER — ADVANCES MACHINE TO NEXT TIE!

QUICKLY — SMOOTHLY — EFFORTLESSLY REGARDLESS OF GRADE OR CURVE

PAYS FOR ITSELF IN SHORT ORDER

The Jackson POWER PUSHER, which may be attached to, or detached from, any Jackson MULTIPLE TAMPER in a matter of seconds, was developed and perfected after many months of research and close observation of its operation in the field. It eliminates all manual labor in advancing the MULTIPLE TAMPER from tie to tie, even on the stiffest grades and curves. It greatly decreases the element of fatigue on the part of the operator and consequently even on the straight, level stretches results obtained with the Jackson MULTIPLE are considerably increased when the POWER PUSHER is employed. And where two MULTIPLES are operated in tandem, the benefit derived from the POWER PUSHERS is more than doubled. Furthermore, use of the POWER PUSHER does not detract from the MULTIPLE'S practicality under average traffic conditions since three men can readily lift it from the track.

Write, wire or phone for complete details of the Jackson POWER PUSHER and our rental plan for those who would like to determine just what it will do under their particular conditions prior to making outright purchase.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

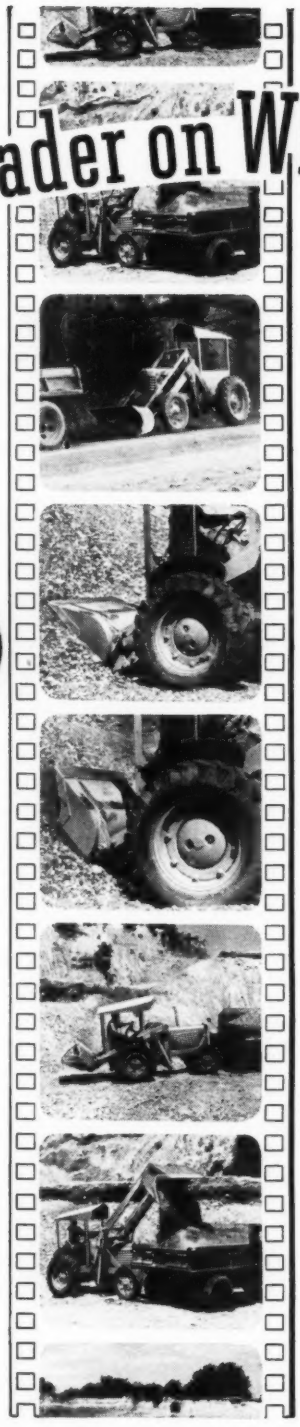
Now... *the Most Versatile Loader on Wheels!*

Here's the most versatile, practical loader ever developed for wheel tractors. It can dig in front . . . dump in front like the conventional loader. BUT, it can also dig in *back* and load in *front.*

You can dig in back . . . move straight forward to the truck . . . the bucket swings *straight over* the roof . . . and the load is dumped into the truck. Thus you eliminate the turning necessary with ordinary front end loaders . . . eliminate *half* the gear shifts and *half* the clutch wear. You save time and fuel . . . cut operator fatigue. You speed loader operations . . . *can load at better than a yard a minute.*

You get far greater traction and almost effortless steering with the Strait-Line. Rear-carried bucket load adds needed weight to the rear driving wheels . . . subtracts weight from the front steering wheels. Increased traction plus the new PUSH-TILT bucket with extended loading lips, enables you to get bigger bucket loads. Two levers control all operations.

Add them all up . . . ability to select your type of digging, front or back as the job requires . . . Strait-Line operation with back digging which gives you faster operation, greater traction and easy steering . . . fuller buckets . . . and you'll see where your operations can profit with the Strait-Line. For information and literature, see your Oliver Industrial Distributor or write direct to The OLIVER Corporation, 19300 Euclid Avenue, Cleveland 17, Ohio.



Conventional front digging, primarily used with Strait-Line where unit digs and moves straight ahead to load.

Back digging. Note how extended loading lips easily penetrate the bank.

PUSH-TILT action which lifts cutting edge 20" and thrusts it into bank.

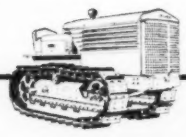
Carrying position—bucket is tilted to retain load and is carried low enough to increase both traction and stability.

Dumping position. Bucket has been carried over the roof and dumps in front.

THE OLIVER CORPORATION

A complete line of industrial wheel and crawler tractors

"FINEST IN INDUSTRIAL MACHINERY"



THE OLIVER CORPORATION

The Sign of Extra Service

talk about stability

. . . CHECK ON FLUTED, COLD ROLLED

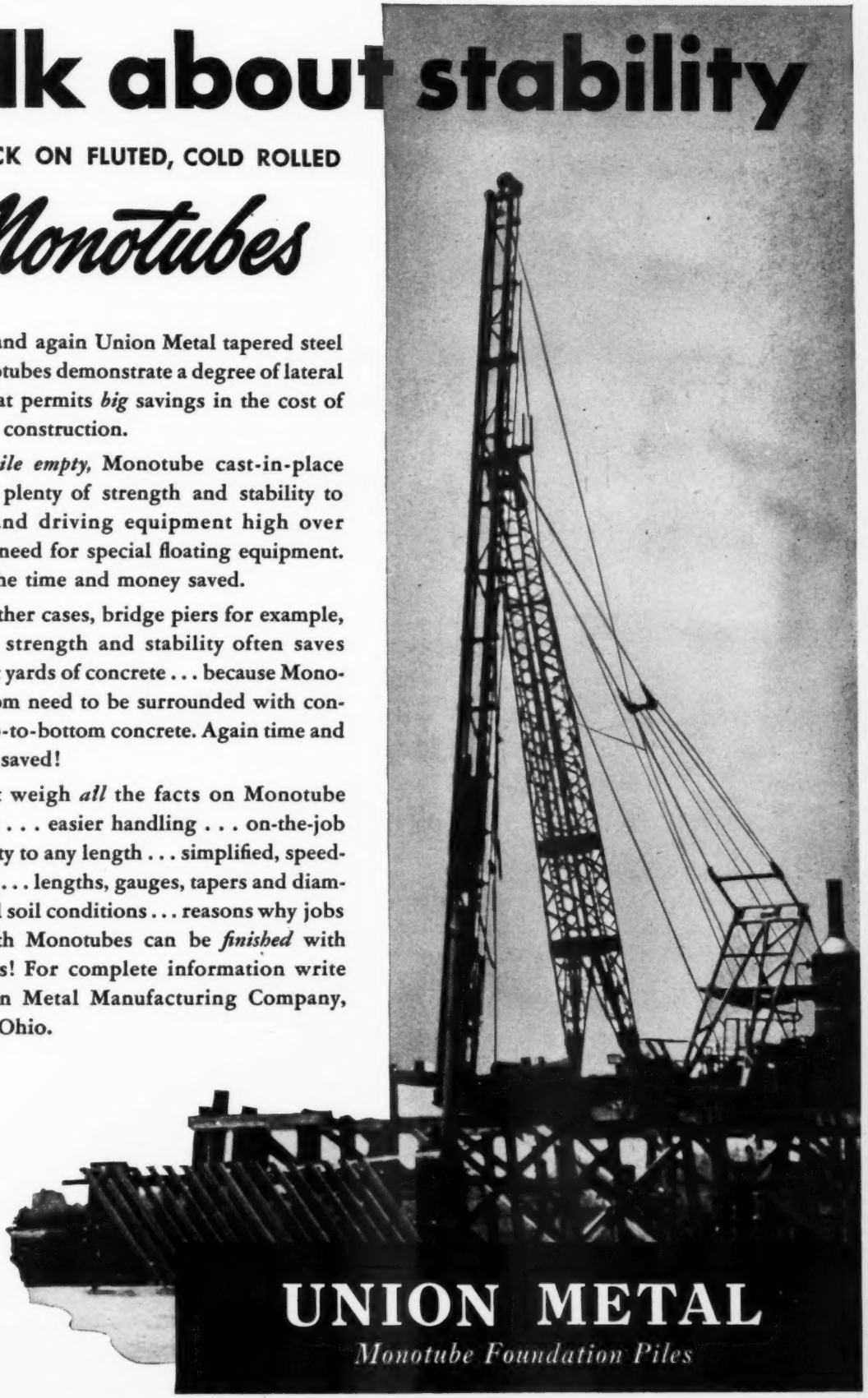
Monotubes

AGAIN and again Union Metal tapered steel Monotubes demonstrate a degree of lateral stability that permits *big* savings in the cost of foundation construction.

Even while empty, Monotube cast-in-place piles have plenty of strength and stability to support land driving equipment high over water. No need for special floating equipment. Think of the time and money saved.

In still other cases, bridge piers for example, Monotube strength and stability often saves many cubic yards of concrete . . . because Monotubes seldom need to be surrounded with continuous top-to-bottom concrete. Again time and money are saved!

Why not weigh *all* the facts on Monotube advantages . . . easier handling . . . on-the-job extendibility to any length . . . simplified, speedier driving . . . lengths, gauges, tapers and diameters for all soil conditions . . . reasons why jobs started with Monotubes can be *finished* with Monotubes! For complete information write The Union Metal Manufacturing Company, Canton 5, Ohio.



UNION METAL

Monotube Foundation Piles

FABCO *Self-Sealing* TIE PADS

Bind Pads to Ties to Keep Out Moisture and Dirt

Conventional illustration of the structure of a Fabco Tie Pad and the special sealer on one side.

FABCO *Self-Sealing* TIE PADS effectively seal out moisture and dirt between the pad and the tie.

Coated only on the side next to the tie. Freedom of movement of the tie plate is permitted with less disturbance to the tie bond.

Special coating is firmly adhered chemically to the pad without decreasing the strength or resilience of the pad.

Sealing agent is specially compounded to withstand extremes of temperature in both summer and winter.

Self sealing pads require no more labor for installation than regular Fabco Tie Pads.

OVER THE YEARS Fabco Tie Pads of resilient rubber and cotton fibre have demonstrated their ability to prevent mechanical wear of ties through elimination of plate cutting, and give long life service as well.

MAINTENANCE OF WAY departments suggested that if Fabco Tie Pads could be bonded to the tie so as to prevent intrusion of moisture or dirt between tie and pad, their effectiveness might be further increased under certain conditions. After exhaustive tests we announce a tie pad sealer that we are confident is superior to anything yet offered . . . Applied to Fabco Tie Pads before shipment it consists of a 1/16" coat of sealing compound on the side of the pad next to the tie. Since tie plates tend to move under traffic, it is advisable not to bond the pad to the plate, but leave the plate free to move, — greatly reducing any tendency to break the seal between the bottom of the pad and the tie . . . Same standard and special sizes as unsealed Fabco Tie Pads, but 5/16" thick instead of ¼".

For Maximum Protection Against Mechanical Wear of Ties
Use Fabco Tie Pads
Sealed or Unsealed According to Conditions

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PITTSBURG 22, 336 4th Avenue
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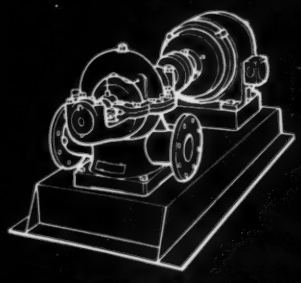
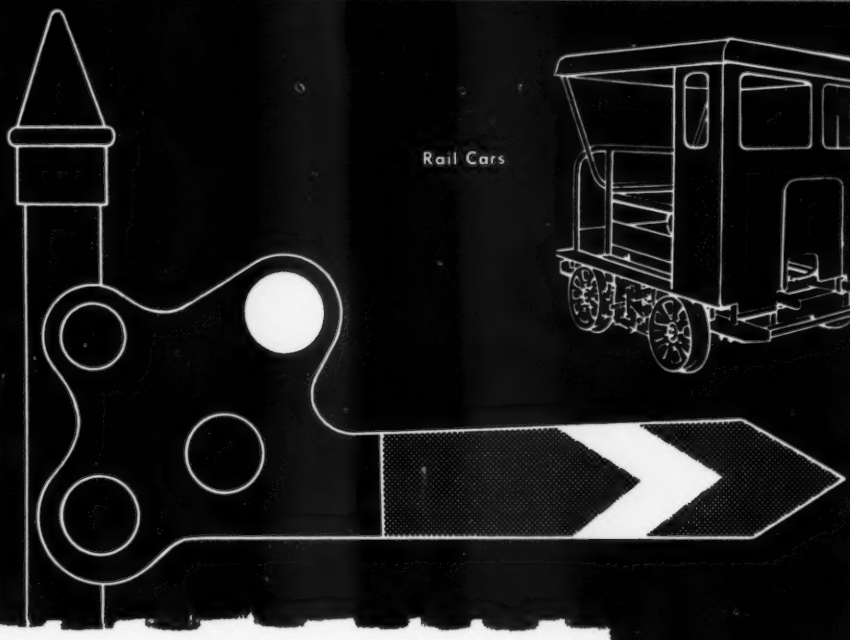
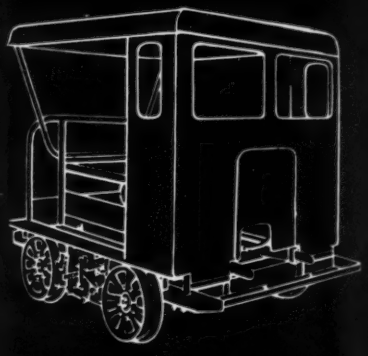
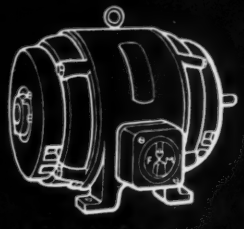


Centrifugal Pumps





Rail Cars



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and Generators

FOR RAILROAD EQUIPMENT IT'S FAIRBANKS-MORSE,

a name worth remembering

DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • PUMPS • SCALES
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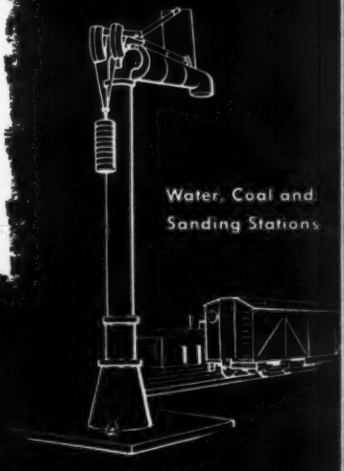
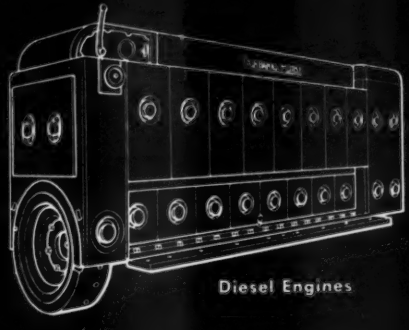
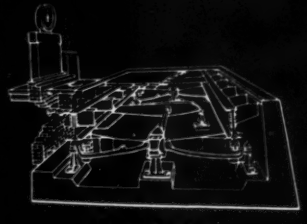
Turbine Pumps



Water, Coal and
Sanding Stations



Diesel Engines



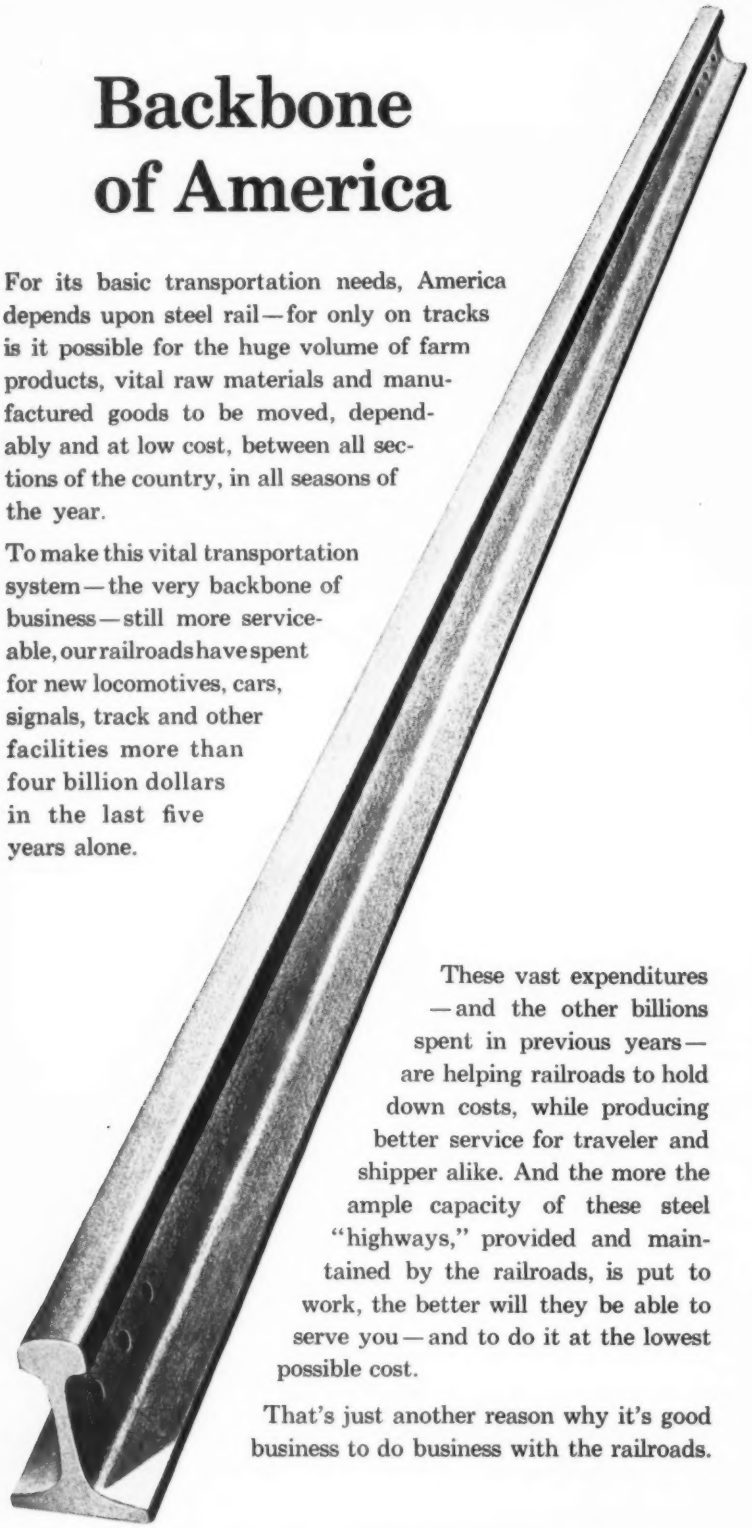
Truck Scales

Track Scales

Backbone of America

For its basic transportation needs, America depends upon steel rail—for only on tracks is it possible for the huge volume of farm products, vital raw materials and manufactured goods to be moved, dependably and at low cost, between all sections of the country, in all seasons of the year.

To make this vital transportation system—the very backbone of business—still more serviceable, our railroads have spent for new locomotives, cars, signals, track and other facilities more than four billion dollars in the last five years alone.



These vast expenditures—and the other billions spent in previous years—are helping railroads to hold down costs, while producing better service for traveler and shipper alike. And the more the ample capacity of these steel "highways," provided and maintained by the railroads, is put to work, the better will they be able to serve you—and to do it at the lowest possible cost.

That's just another reason why it's good business to do business with the railroads.

ASSOCIATION OF AMERICAN RAILROADS
WASHINGTON 6, D. C.

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YES!

it is

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CF&I is proud of its part in serving this backbone industry of our nation.

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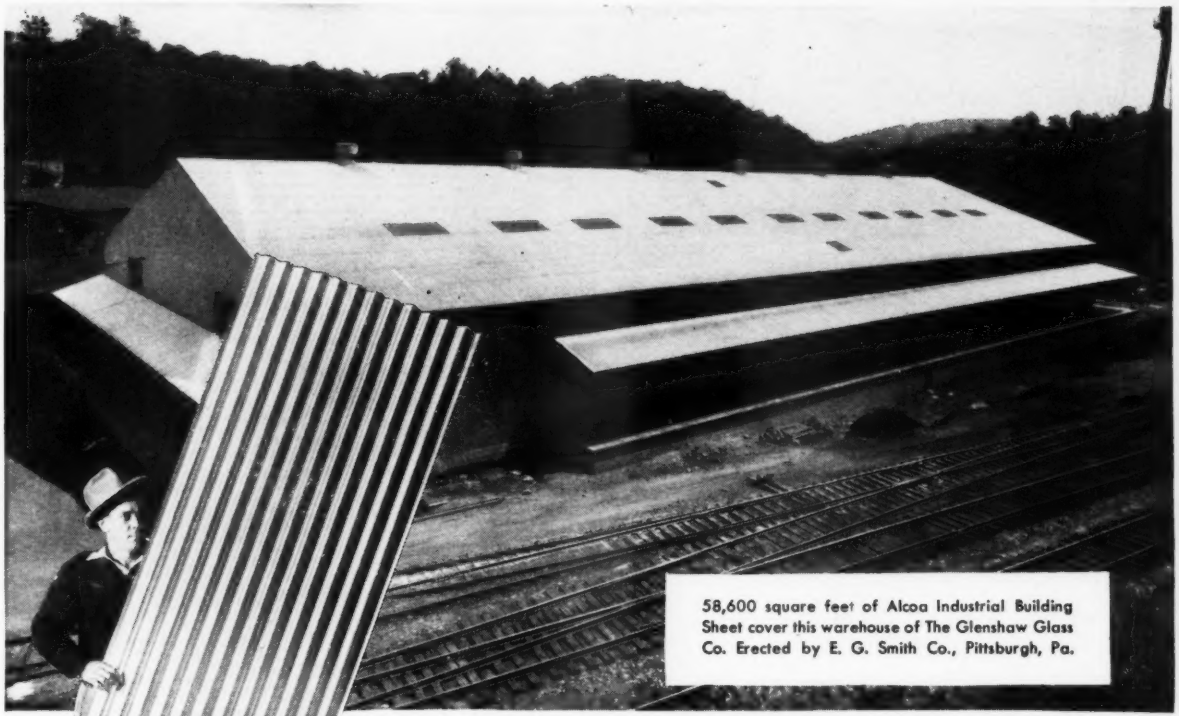

58,600 square feet of Alcoa Industrial Building Sheet cover this warehouse of The Glenshaw Glass Co. Erected by E. G. Smith Co., Pittsburgh, Pa.

IT WENT UP *FAST!* IT'S BUILT TO *LAST!*

...IT'S ALUMINUM!

Covered with big, easy-to-handle units of Alcoa Industrial Building Sheet, this building went up fast, was ready for use as soon as the last fastener was installed. It needs no painting now... or ever. Skylights of translucent plastic with matching corrugations went in with the roofing... no frames, no extra glazing required.

If you want speed, if you want freedom from maintenance, if you want corrosion resistance and lasting economy, figure your next building in Alcoa Industrial Building Sheet. For price and engineering data, call your nearby Alcoa Sales office or mail the coupon.

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Alcoa Industrial Building Sheet may be erected over steel or wood; may be fastened by nails, purlin nails, straps, clips, screws or weldable studs.

Lengths: 5 to 12 feet. Widths: Roofing, 35 inches. Siding, 33⅓ inches.

Thickness: .032 inches—equal to 22 U. S. Gauge.

Available for prompt shipment with flat and preformed flashing; all types of fasteners.

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Please send me complete engineering and application data on Alcoa Industrial Building Sheet.

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ALCOA

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No. 262 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

79 W. MONROE STREET
CHICAGO 3, ILL.

Subject: Editorial Judgment

October 1, 1950

Dear Readers:

In editing an industrial magazine such as "Maintenance" it would be dangerous to get into the habit of doing things the same way month after month and year after year. Magazine readers may not realize it but their tastes and desires with reference to the nature and appearance of the material they read are constantly changing, and if a publication is to continue to be successful its editors must endeavor to anticipate these changes and adapt their product to them. There are various means available for determining reader opinion on matters of editorial policy, but these means all have their limitations. Consequently, in most instances, when a question of policy is being considered, the editors must rely largely on their collective judgment in coming to a decision.

I wish to cite here an example of the types of questions regarding editorial policy that are constantly arising. For a long time, as many of you are aware, it has been our practice to "cover" the Roadmasters' convention in a comprehensive manner in the October issue each year. As a feature of this issue all reports of technical committees have been published in full. The proceedings of the convention of the American Railway Bridge and Building Association are similarly reported in the November issue.

It has now occurred to us that perhaps a better formula can be devised for covering these conventions. Since the committee reports of these associations are usually of a comprehensive nature, dealing as they do with rather broad subjects, they necessarily and unavoidably make rather "heavy" reading. With this thought in mind the suggestion has been made that perhaps our coverage of the two conventions would be made more palatable for you if we were to publish a single "high light" story on both of them in the October issue. This story, rather than containing the committee reports in full, would possibly include only the conclusions or, at the most, brief abstracts of the reports. A story of this type, since it would involve much less text than is required under the present plan, would permit us to publish a great many more convention photographs than is now possible. Also, a larger number of articles on current developments could be included, along with the convention story.

I am merely giving you here some of the considerations that come to mind as we contemplate this proposed new plan for covering the September conventions. We must, of course, balance the merits of the new idea against those of the present plan. As one means of helping to crystallize our thinking on the subject we will no doubt, in the months to come, request many of you to give us the benefit of your thinking. Perhaps then we will be in a position to make a decision.

Thus, as you can see, a fine degree of judgment is needed in arranging editoral programs for magazines such as ours. In the exercise of judgment no one is infallible, and that is why it is so helpful when you—the readers—take a moment from some busy day to write us regarding any idea you may have.

Yours sincerely,

Merwin H. Dick

MHD:ag

Editor

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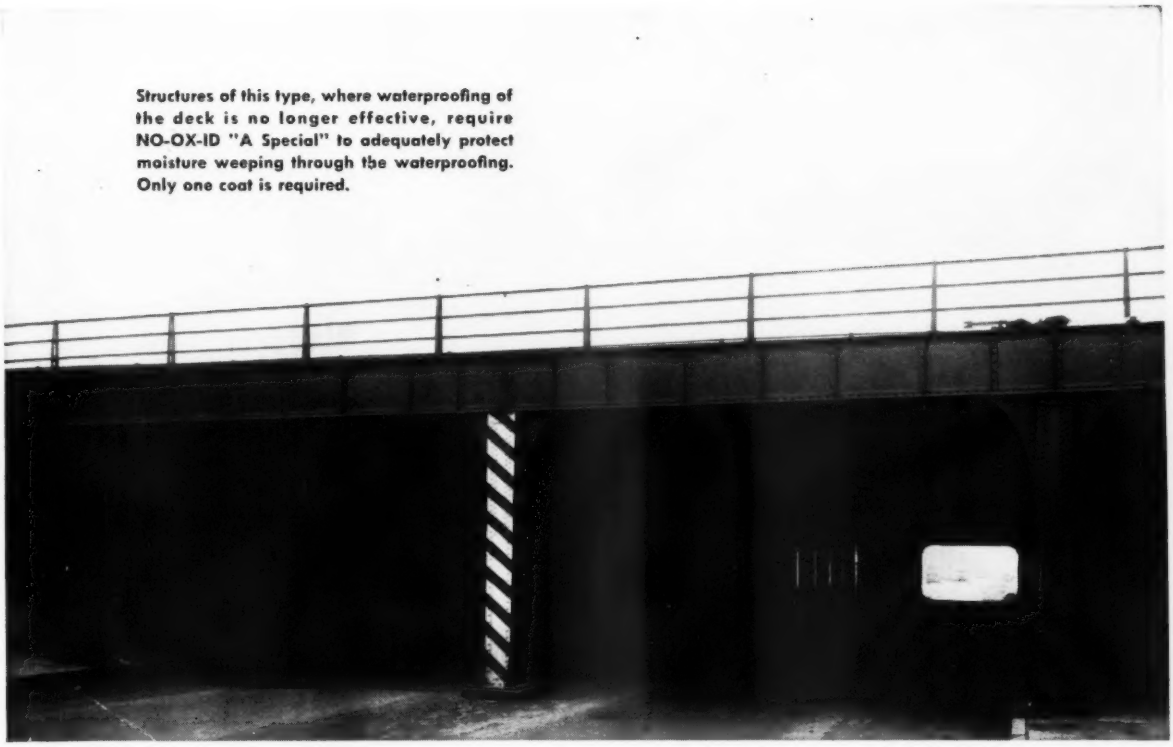

Structures of this type, where waterproofing of the deck is no longer effective, require NO-OX-ID "A Special" to adequately protect moisture weeping through the waterproofing. Only one coat is required.

ONE COAT PROTECTION FOR VIADUCTS WITH DEARBORN NO-OX-ID "A SPECIAL"

Moisture, brine, locomotive gases, live coal and cinders subject exposed and hidden surfaces of viaduct, bridges and other valuable structures to severe corrosive damage.

Protection of these surfaces can be simple—and inexpensive, too. Dearborn NO-OX-ID "A Special" is the proved answer. Just wire-brush the surface to remove loose paint film and rust scale. Then for lasting protection, apply a single coat of NO-OX-ID "A Special." Metal loss is prevented and the safety factor of the structure is preserved.

Dearborn NO-OX-ID prevents rust wherever it threatens. A Dearborn sales engineer will gladly recommend the correct NO-OX-ID for your job condition.

WRITE FOR THIS VALUABLE BOOKLET!

A copy of the Dearborn booklet entitled "NO-OX-ID for Maintenance of Steel Structures in the Railroad Industry" will be sent on request.

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Please send a copy of "NO-OX-ID for Maintenance of Steel Structures in the Railroad Industry."

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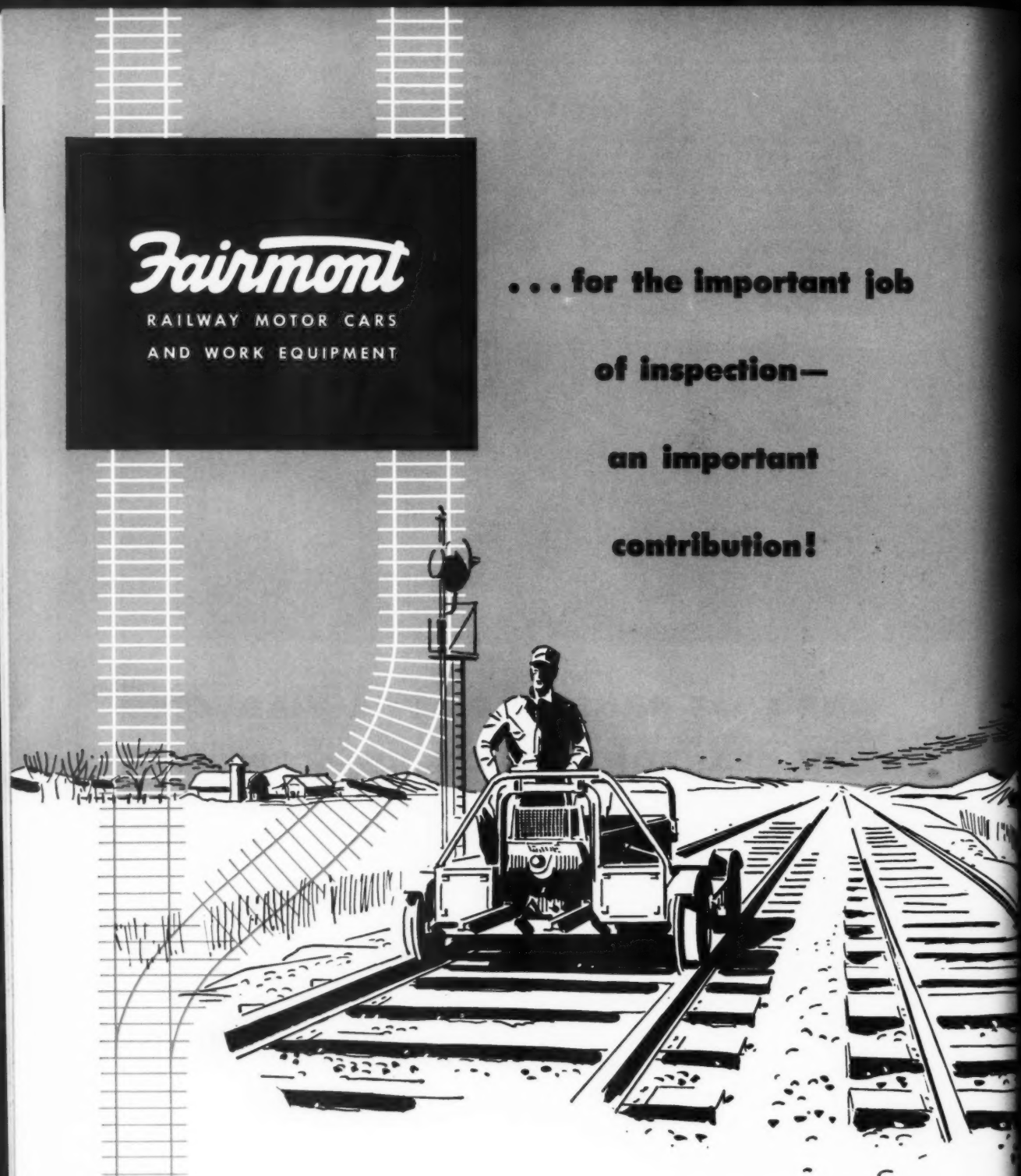

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Performance
ON THE JOB
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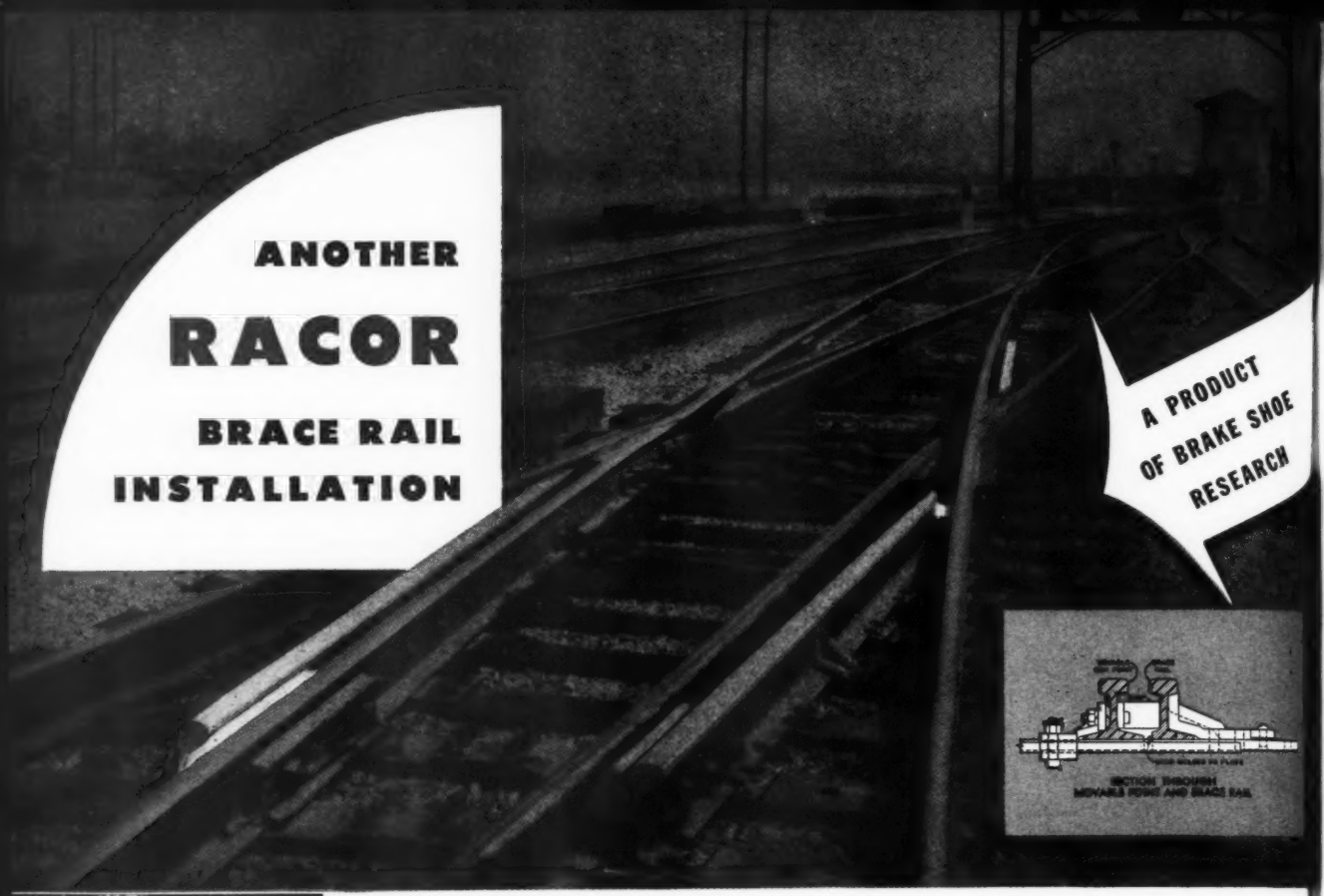

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Competition —

Maybe It Won't Take Your Job, But—

Readers of this magazine hear and read a great deal about how the railroads are being prevented from earning an adequate return on their investment because of the business lost to subsidized competition on the highways, in the air and on the inland waterways. What is said about this subject by railway management, and what is printed about it in railway publications, is intended partly to arouse railway employees to the fact that, because unfair competiton takes business away from the railroads, it is a threat to the economic security of the people working for the carriers. The thought is that these employees will use their influence, at the polls and among the people they meet in every day life, to get the situation corrected.

However, it is probably safe to say that many railway employees are convinced that their positions are secure against whatever inroads unfair competition may make on the business carried by their employer. In the first place it is human nature to feel that, if lightning should strike, it is practically a certainty that somebody else will be the victim. Secondly, many persons, fairly well up on the scale of employment, are probably justified in the conviction that the danger of conditions becoming so serious as to jeopardize the security of their positions is exceedingly remote. Quite probably the majority of the readers of this magazine are in the latter category.

But there is another factor to be considered in this connection which is of particular concern to employees in a supervisory capacity. This factor was partially developed by President Gustav Metzman of the New York Central System in an address before members of the Toledo (Ohio) Chamber of Commerce and visiting industrialists gathered for the dedication of a new $5 million passenger station that the New York Central has built at Toledo. After declaring that "super-subsidies to our competitors were six times as much as the total net income of the nation's railroads last year," Mr. Metzman expressed "little wonder . . . that your railroads generally have not been financially able to provide new passenger stations as fast as they are desired."

If Mr. Metzman had been speaking to a group of railway maintenance officers he could have elaborated on this point at great length. He might first have pointed out how subsidized competitive transport agencies, by taking business away from the railroads, comprise a basic reason why maintenance men are frequently unable to get the money they feel is needed for the adequate upkeep of the properties entrusted to them. Knowing from his own experience that inadequate allotments for maintenance are a source of great concern to the men who supervise this work, Mr. Metzman, therefore, could then have made the point that here is sufficient reason, in itself, why employees of supervisory rank and higher in the maintenance departments should feel impelled to do everything they can to force the discontinuance of subsidies to the railroads' competitors.

Maybe those trucks rolling down the highway paralleling your territory may never cause you to lose your position, but there is reasonable certainty that, if your allotments of men and materials have been below actual needs, the additional money you should have received for this purpose has been going into the pockets of the truckers because they don't have to pay their rightful share of the cost of maintaining the highways they use.

IDLE MACHINES—

Are There More Now Than Ever?

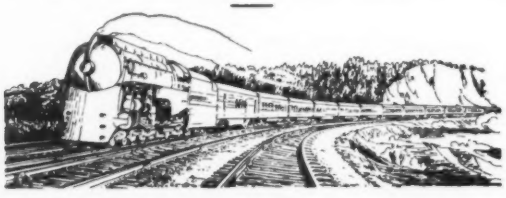
WHEREVER railway maintenance men congregate, the conversation sooner or later gets around to the subject of machinery and what it is doing or can do in helping to get more work done. During the past year there have been increased reports of equipment being out of service because of mechanical trouble. Have these reports been heard because more machinery has broken down under service, or because that which has broken down has caused more disruption to maintenance programs.

This question, when put informally to several groups of maintenance men recently, brought various replies. One man was almost vehement in stating that it was his firm conviction that some of his machines were breaking down more frequently than ever. For that he blamed manufacturers; first, for not making their products capable of withstanding heavy service; second, for their failure to be able to supply sufficient repair parts or, in his case, properly redesigned parts to put his machines in running order quickly; and third, for "hiding" their service men so they could not be found when they were needed.

Another man took up the cudgel in defense of the manufacturers by stating that he had had no trouble with the particular machines in question. He said that he followed a system of preventive maintenance, not sparing the oil can, grease cup and wiping rag. His mechanics are taught to take pride in the cleanliness of their machines and spend much time smoothing-up the operation of their equipment and, as a consequence, have to devote little time to the repair of machines that are out of service. The work of the mechanics is greatly simplified, he said, by well-trained, efficient operators who know their equipment—its limitations as well as its abilities.

Another man, discussing this same problem, pointed out that loss in production, when considered in connection with the 40-hr. week, so magnifies the effect of "down time" of defective equipment, that it might be easy to get the idea that machines are out of service more often than is actually the case. He showed by a little arithmetic that, in previous years, whenever a machine was idle a day, weekly production was reduced 16 2/3 per cent, whereas a day's idleness now reduces the weekly production by 20 per cent. This increase in loss of production seems insignificant until one relates the effect of the idle machine to the 40-hr. week, and finds that, in comparison with 1¼ years ago, only two-thirds of a week's production is left.

Perhaps it's the sudden realization of how little productive time is left that makes some men angry and prone to blame the offending machine or its manufacturer. It makes others resolve to leave no stone unturned to see that their machines are placed in good shape during off seasons, and then given the best of preventive maintenance to keep them in optimum running condition. Can both be right?



YARD TRACKS —

Cleaning Machines Reveal True Conditions

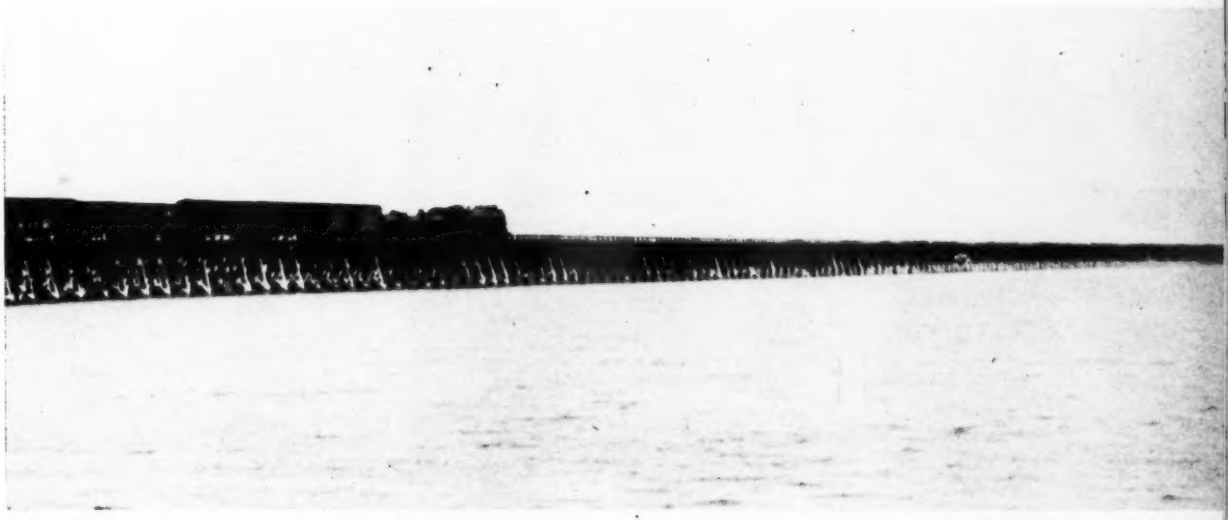
THE development of yard-cleaning machines has evoked keen interest among many track supervisory officers who have yards under their jurisdiction. Available knowledge of experience with these machines indicates that there are important advantages in their ownership and operation. At least one roadmaster states, after using these machines, that a single unit does the work of 200 men and that, because of its working speed and the favorable results obtained, it is relatively easy to obtain the cooperation of the yardmaster in temporarily taking a track—even a classification track in a hump-retarder yard—out of service for cleaning purposes. Another consideration in the use of track-cleaning machines is that the true condition of the tracks is revealed.

Only a yard track supervisor knows of the innumerable times he has been wakened by the ringing of the telephone at night to be informed of a derailment in his yard, and, on clearing up the wrecked equipment, has learned that poor track conditions were largely responsible for causing it. Generally, wherever yard tracks are found with an accumulation of refuse on them, it may be expected that the tracks are in poor condition. The tracks in many such yards were originally laid with secondhand rail of relatively light section, placed directly on the ties, and usually they have been in service for a long period of time during which they were switched with steam switch engines. After the passage of a yard-cleaning machine, the corrosive effect of the front-end cinders and of salt-brine drippings from refrigerator cars is brought clearly to light. Frequently, the base flanges of the rail are found to be badly corroded, and the heads of most of the spikes are entirely missing.

With the dirt covering removed from the tracks, the supervisor can quickly determine where track maintenance has been neglected and take immediate steps to correct any bad conditions, even while the track is out of service to permit operation of the cleaning machine. Also, tie conditions become more apparent and tie renewals can be planned and more easily made. When the tracks have been brought up to the road's yard-track standard, and with visual inspection of the trackage again possible, the supervisor will be able to go to bed with reasonable assurance that, if his slumber is disturbed, it will be because of something else besides a yard derailment.

MAINTAINING

The Longest Railroad Trestle



The Southern Pacific's Great Salt Lake trestle is 62,605 ft. long and is the longest structure of this kind in the United States

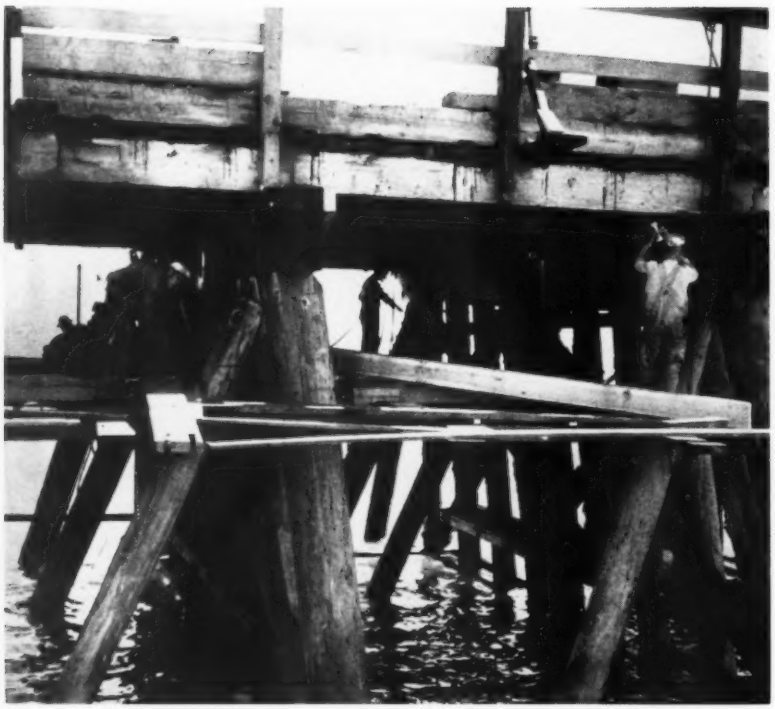
Furious storms, high waves, accumulations of ice, and water-level fluctuations are some of the adversities that make the maintenance of the Southern Pacific's Great Salt Lake trestle a difficult job

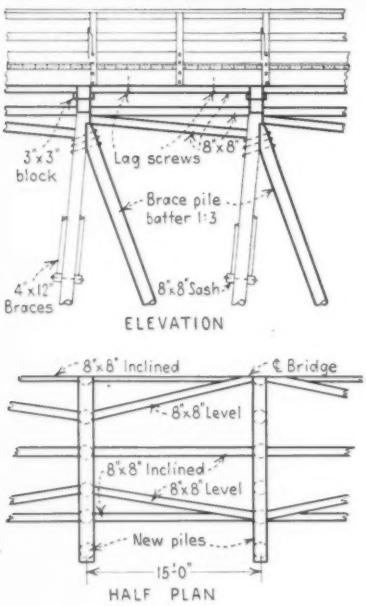
By J. P. DUNNAGAN
Engineer of Bridges
Southern Pacific Company, San Francisco, Cal.

The batter piles driven to reinforce the trestle ranged in length up to 140 ft.

• When the Southern Pacific constructed the Lucin cutoff in Utah in 1903, it shortened its transcontinental main line (the Overland Route) by 44 mi., but, at the same time, it acquired the maintenance of about 12 mi. of ballast-deck pile trestle across Great Salt Lake —a 1,500 sq. mi. body of water with many formidable characteristics. For one thing, its bottom is such that when any pile, regardless of length, is driven into it, the pile will rebound about ¼ in. after the last blow. For another, it is swept periodically by storms of hurricane velocity which kick up the water so furiously that conventional longitudinal bracing, if used, would soon be torn away.

Furthermore, troublesome accumulations of ice form on the lake in cold weather in spite of the high salt content of the water. This





Above—At locations where the bents had a tendency to lean, stringer struts were installed between the bents. The location and arrangement of these struts are shown in the drawing at the left

is due to the freezing of fresh water from tributary streams, which, because of its lower density, floats on the salt water. Finally, the lake level rises and falls in cycles over the years.

The Great Salt Lake trestle is 62,605 ft. long and is the longest structure of this type in the United States. Of this length 46,450 ft. carries a single track; 14,925 ft., two tracks; and 1,230 ft., three tracks. The total number of bents in the trestle is 4,186. The bents are spaced 15 ft. apart, and the piles range in length from 80 ft. to 140 ft. All the material in the bridge is untreated, and all the hardware is galvanized.

When the trestle was built in 1903, its base of rail was established at an elevation 17 ft. above the level of the water at that time. The fill approaches were constructed with a base-of-rail elevation 5 ft. lower than this. Thereafter the lake began to rise and by 1924 its level was 7 ft. higher than when the bridge was built, or only 10 ft. below the base of rail. The high water at that time caused considerable concern on the road and surveys were started to relocate the line on solid ground. Furthermore, when the lake reached this level, the base of rail on the approaches was only 5 ft. above it, and during stormy weather accumulations of ice piled up on the tracks.

However, after 1924 the water level began to fall, reaching at its lowest stage an elevation 4 ft. below the level existing when the structure was built. It has fluctuated since then and, as of June 1, 1950, was 9 in. above the 1903 level.

As the opportunity arose during the years of low water the trestle was reinforced in every way possible. One of the means employed was the driving of additional piles in each bent. This work required double capping the bents because it was necessary to make a new cutoff to bring the old piles and the new ones to the same elevation. At locations where the bents had a tendency to get out of plumb, brace piles were driven and longitudinal stringer struts were installed between the bents. The location and arrangement of these struts are shown in the accompanying drawing. The cross bracing of the bents was renewed where necessary and the sash braces were dropped to the level of the lake.

Renewing the Deck

The original deck of the structure was renewed during the years between 1920 and 1926. The new stringers were given a salt-preservative treatment before they were applied, simply by soaking them in the lake for 90 days. The deck planking was replaced with redwood lumber and the ballast trough was covered with roofing paper. The latest inspection of the deck, made by removal of the ballast and planking at selected locations, indicated that a number of years of deck life may be expected.

The original piles driven in 1903 are still in service and show no signs of decay. It has been necessary to replace only those few piles which had been struck by lightning or cut by ice.

As protective measures against fire, 5-gal. fire extinguishers and fire buckets have been placed at intervals along the deck, one portable fire pump has been provided, and two launches equipped with fire pumps are held in readiness. Two men are stationed at the trestle permanently. These men make a launch inspection of the entire bridge on three days each week and on alternate days make a motor-car inspection of the deck.

Speed restrictions on the bridge limit the speed of streamlined trains to 30 m.p.h., and freight trains and other passenger trains to 20 m.p.h. All trains slow down to 15 m.p.h. when passing through turnouts on the bridge. Traffic is governed by a centralized control system operated from Ogden.

Flush-Type Facilities For Servicing Diesels

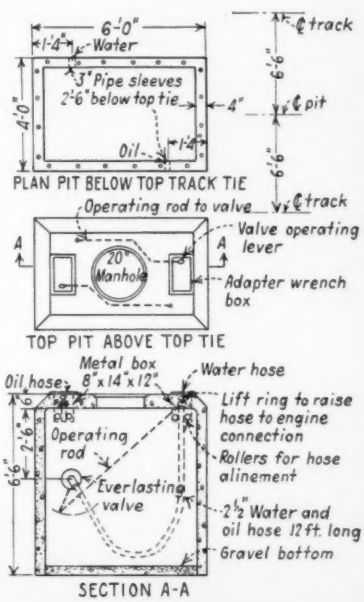
• The St. Louis-San Francisco assured itself of several marked advantages when the road devised and constructed underground pits for housing the necessary valves and hose lines used for supplying Diesel passenger locomotives with water and fuel oil during station stops. By means of these servicing pits the locomotives can be serviced at regular station stops while still coupled to their trains and in less time than it takes to handle the "head-end" business. Other advantages, it is said, include hoses of minimum lengths, only fairly-close engine spottings, the elimination of all above-track cranes, posts and pipe lines, and a safe and relatively-clean place to store the hoses when not in use. Furthermore, the servicing pits can be installed between tracks having track centers as small as 13 ft.

The pits were built of reinforced concrete with an open bottom as shown on the accompanying sketch. At some locations where an underlying strata of earth and gravel is available, the pits are drained by natural seepage. At other locations where natural seepage is not feasible, a concrete floor is placed in the bottom of the pits and small electric sump pumps and sewer outlets are used to rid the pits of water. The top of each pit is equipped with a 20-in. manhole with a metal cover at its center and a metal outlet box, with ball-bearing hose-alinement rollers and a hinged lid, near each end.

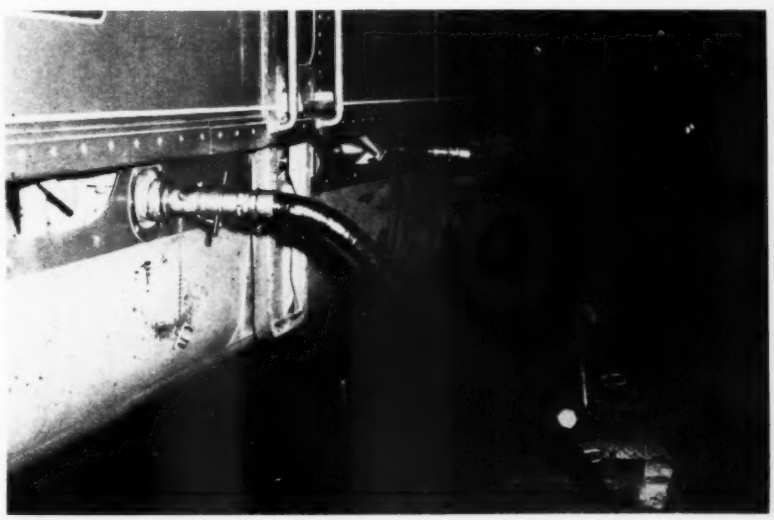
A pipe line, 4 in. in diameter, carrying fuel oil, and another pipe line of the same size for conveying water, extend underground from a pumphouse and are brought to each pit from opposite sides and near opposite ends. Inside of each pit a 2½-in. Everlasting valve was installed on each line and a 2½-in. servicing hose, 12 ft. long was attached to each valve. The free end of each hose passes through the ball-bearing hose-alinement rollers of one of the outlet boxes and is equipped with a lift-ring gland and and female quick coupling for attachment to the adaptor on the inlet of the locomotive. The operating lever rod of each of the valves extends to the corresponding outlet box.

Since the Frisco streamlined passenger trains use two Diesel locomotive units, two servicing pits, spaced the proper distance apart, are required at each end of a station platform for a one-spot servicing, to serve trains headed in either direction. In operation, a passenger train pulls into the station and stops with the servicing pits centered approximately between the water and fuel-oil intake ports of the respective Diesel units. An adaptor is removed from its storage place in each outlet box of the servicing pits involved in servicing the locomotive, and is applied to the intake ports of the locomotive unit. The respective hose lines are then coupled with quick couplers to the adaptors and the valves are opened by pulling the rod levers. Push buttons for starting and stopping the fuel and water pumps are placed in metal boxes at the hose outlet ends of the pits. When the locomotive tanks have been filled, the pumps can be stopped either by stop button or by closing the valves in the pit, causing back pressure to be built up in the lines which closes the solenoid switches and causes the pumps to be stopped. The hoses are detached from the locomotive and allowed to sink into the pits until arrested by the couplers engaging the hose-alinement rollers. The adaptors are then removed from the locomotive units and are placed within their respective outlet boxes.

One such installation has been in service on the road for more than a year and has performed satisfactorily. In general, 1,000 to 1,200 gal. of water and almost the same amount of fuel oil are placed on the two-unit locomotives by two attendants in from six to eight minutes. These pits were designed by F. A. Pollak special engineer, and were installed under his direct supervision.

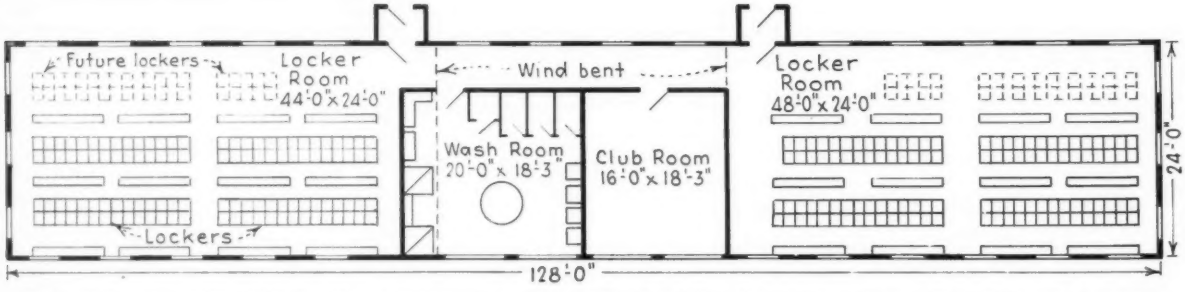


Right—Plans and section of the servicing pits. Below—The pits are arranged in pairs to permit one-spot servicing of two-unit Diesel passenger locomotives



Above—This new Steelox building, housing welfare facilities for more than 250 trainmen, was erected by 3 men in less than a week. The bents in the construction view at left give building rigidity during high winds

Prefab "Crew Club" Goes Up in a Hurry



Plan of the new welfare building. The structure rests on a peripheral reinforced-concrete wall extending 11 in. above ground

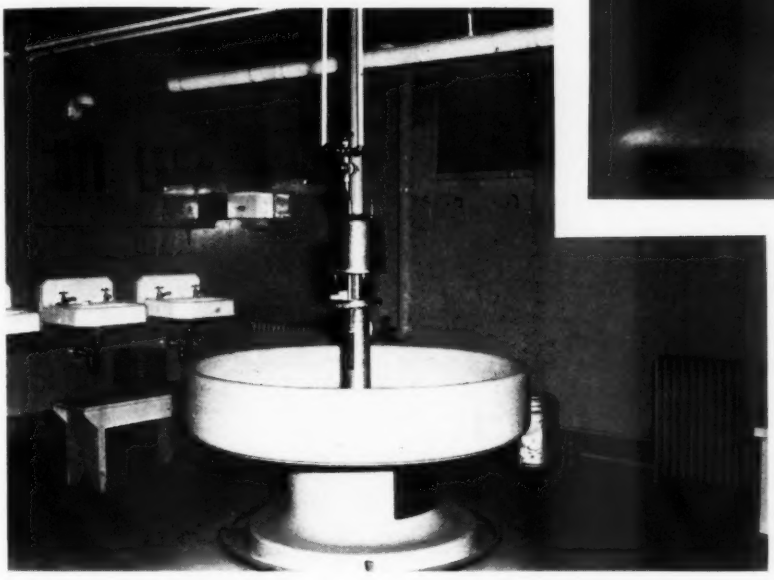
• Faced with the necessity of augmenting the welfare facilities for trainmen at one of its terminals, the Union Pacific chose to erect an Armco Steelox building. Specially braced to withstand strong winds and insulated to retain heat in winter and to exclude it in summer, the structure was designed to accomodate more than 250 men in an uncrowded locker room at each end and a clubroom and a modern washroom in the center. Steelox buildings such as this are prefabricated of interlocking steel panels of 20-gage material 16 in. wide, which fit together to form self-supporting sides. All parts are fastened together with specially-hardened galvanized bolts and screws.

This structure, extending in an east-west direction, rests on a foundation consisting of a peripheral reinforced-concrete wall, 8 in. wide by 4 ft. 3 in. deep, of which 11 in. is above the ground. The bottom of the wall is keyed into the top of a reinforced-concrete footing, 1 ft. 4 in. wide and 8 in. deep. For fastening the building panels to the foundation, ½-in. anchor bolts, spaced, 4 ft. center to center, were embedded in the wall. A 5-in. concrete floor rests on the ground and is separated from the wall by mastic expansion strips ½ in. thick.

To give the building rigidity during high winds, two wind bents were erected 32 ft. apart. Each of these bents is 48 ft. from the near end of the building. They consist in each case of two opposite columns anchored to the foundation and joined at the top by a horizontal member knee-braced to the columns. After these bents had been placed, no special tools or equipment were required to erect the rest of the prefabricated parts. The ease and speed with which the entire building was erected were major factors in minimizing the total cost of the structure. This work was done by a three-man crew in less than a week, after which the structure was turned over to the interior finishers.

The erection work included attaching a 4-ft. by 6-ft. Steelox shed-roof building to the north side of the main building at each of two

Steelox building, 24 ft. by 128 ft. in plan was erected on the Union Pacific by three men, unassisted by special equipment, in less than a week. Structure is specially braced for heavy wind loads, is insulated, and has modern equipment and appointments.



Above—The locker rooms are well lighted, steam heated and easily kept clean

Left—One of the features of the washroom is a 54-in circular wash fountain

entrances. These units serve as storm vestibules to prevent heat from being lost through the doorways. The seams between these units and the larger structure were caulked to make them watertight, and eave troughs were installed over the doorways to protect those using the entrances. At all other locations water is allowed to drain directly from the eaves of the gable roof to the ground.

Both the side walls and ceiling of the structure are insulated with three inch rock-wool batts. The ceiling batts were fastened to the tops of 2-in. by 6-in. joists spaced 16 in. center to center, and were covered, top and bottom, with impregnated paper. In preparation for applying the side-wall insulation, 1-in. by 3-in. wood furring strips were fastened on 16-in. centers to the Steelox panel ribs by mean of helyx nails, and the rock wool batts were fastened to these strips.

Plywood Walls Inside

All interior wall and ceiling surfaces consist of ½-in. plywood. On the ceiling the plywood was fastened directly to the bottom edges of the ceiling joists. On the end and side walls the plywood was placed against the insulating batts and nailed to the wall ribs.

The partition walls separating the clubroom and washroom from each other and from the locker rooms were formed by attaching plywood to both sides of 2-in. by 4-in. studs. To form these rooms, one transverse wall, 18 ft. 3 in. long, was placed in line with the east wind bent—48 ft. from the east end of the building— another was installed 16 ft. west of the first and a third 20 ft. west of the second. By joining the north ends of these three partitions a hallway was formed along the front of the building between the two entrances.

Locker Room

The locker room at the east end of the building measures 24 ft. by 48 ft. and that at the west end is 24 ft. by 44 ft. in plan. For the time being, one of these locker rooms is furnished with 110 lockers, and a number of wood benches, while the other has 112 lockers. There is space in each room for an additional 38 lockers.

The washroom contains a 54-in. circular wash fountain, four lavatories with a wall mirror above each, two metal shower cabinets, two urinals, three toilet bowls enclosed in metal compartments, a janitor's sink, several paper-towel containers and waste baskets. The clubroom contains tables and chairs.

The building is heated by steam radiators which receive steam from a central heating source. Daylight illumination is provided by 39 four-light windows which can be pivoted for ventilation. Artificial light comes from a number of fluorescent ceiling fixtures and from incandescent wall lights placed over certain of the lavatories. To prevent condensation above the insulated ceiling two revolving ventilators are located on the ridge of the roof.

Painting the Exterior

It was possible to spray-paint the exterior of the building as soon as erection was completed because the Steelox panels received a bonderizing treatment during manufacture which eliminated the need for etching the galvanized surfaces on the job or allowing them to weather to provide a bond for the paint.

The building was constructed for the Union Pacific by the Paul Sothman Construction Company as prime contractor. This company sublet the erection of the structure to the construction department of Armco Drainage & Metal Products, Inc., which company also furnished the Steelox material.

Convention Review —

ROADMASTERS' ASSOCIATION

Track maintenance officers talk over current problems at Chicago convention and also give attention to the complications that would result in the event of another world conflict

• While work-a-day problems occupied the center of the stage at the 62nd annual meeting of the Roadmasters and Maintenance of Way Association at Chicago, September 18-20, the gathering clouds of war, with all their implications for track maintenance officers, were not overlooked. Continuing a practice that was first started in 1946, this meeting was held concurrently at the Stevens hotel with the annual convention of the American Railway Bridge and Building Association. The two meetings convened in a joint session on Monday morning, September 18, after which the two groups separated to hold individual sessions. However, they reconvened in another joint session on Tuesday afternoon to hear three addresses on subjects of mutual interest.

One of the most significant features of these conventions was the magnitude of the attendance which was of record proportions. During the three-day period a total of 897 members of the two associations and 262 guests registered at the meetings, the aggregate attendance being 1,159 members and guests. This compares with a registration of 808 members and guests in 1949, and 900 members and guests at the 1948 meeting, the latter figure constituting the previous high record. Doubtless contributing in an important measure to the large attendance was the record display of manufacturers' products that was on view at the Coliseum during the meetings. This exhibit was sponsored jointly by the Track Supply Association and the Bridge and Building Supply Men's Association. Products of 122 manufacturers were on display in 250 booths. The two supply associations were also hosts to the members of the two railroad groups and their families at a banquet on Tuesday evening, which was attended by 1596 persons.

The proceedings of the Roadmasters' sessions are reviewed in this article, along with a brief account of the events transpiring during the joint sessions. An account of the separate activities of the Bridge and Building Association will appear in the November issue.

Presiding jointly over the combined opening session on Monday morning were A. G. Reese, district maintenance engineer of the Chicago, Burlington & Quincy, Galesburg, Ill., and president of the Roadmasters' group, and W. F. Martens, general foreman bridges and buildings, Atchison, Topeka & Santa Fe, San Bernardino, Cal., and president of the Bridge and Building Association. All separate sessions of the Roadmasters' meetings were directed by Mr. Reese, assisted by C. Halverson, general roadmaster, Great Northern, Willmar, Minn., and first vice-president of the association.

At the opening session the principal address was made by J. H. Aydelott, vice-president, Operations and Maintenance department, Association of American Railroads. Words of greeting were also heard during this session from H. S. Loeffler, assistant chief engineer, Great Northern, St. Paul, Minn. and president of the American Railway Engineering Association; from

President A. G. Reese presided over sessions of the Roadmasters' Association

J. H. Aydelott delivered the principal address at the joint opening session

A. R. E. A. President H. S. Loeffler gave greetings to joint opening session

Kenneth Cavins, president of the Track Supply Association; from G. R. Betts, president of the Bridge and Building Supply Men's Association; and from Lewis Thomas, secretary of the Track Supply Association and director of exhibits for both of the supply groups.

The situation confronting track supervisory officers as a result of the unsettled international situation was the principal theme of the address made by Mr. Reese at the opening session of the Roadmasters' Association. "During the major portion of the past decade," he said, "we have experienced federal control of men and materials, and reinstallation of these controls can be expected. The term of these new controls is indefinite but we can be assured that they will encompass the period of conflict, and for a further time into the future."

Pointing to the extensive use of heavier rail and fastenings, ties "seasoned and treated in the latest and best method," and the surfacing of this improved track structure with more permanent ballast compacted by modern equipment, Mr. Reese declared that these things give assurance that we will be able successfully to transport the materials of this war, in addition to the commodities necessary for the very existence of the 150,000,000 people in these United States, and also the millions of inhabitants of other nations over whom we have assumed the position and obligation of a guardian angel."

Discussing the role of the roadmasters in the situation now developing Mr. Reese stated that present speeds and traffic, swollen by a large anticipated tonnage of war materials, will impose a burden on the track structure that will necessitate increased maintenance. Consequently, he said, the perpetuation and further improvement of the present standards of maintenance offer a challenge to the maintenance officers of today and tomorrow. "We may reasonably expect the trend toward heavier and more permanent parts of the track structure to continue," he declared, "and to extract the maximum from these materials will test the ability of the roadmasters."

The principal business transacted during the separate sessions of the Roadmasters' meetings consisted of the presentation and consideration of six committee reports on the following subjects: Power Tamping Equipment and Its Effectiveness; Improved Methods Used in Surfacing and Raising Tracks to Grade and Line Stakes; Methods of Organizing, Equipping and Operating Rail Renewal Forces; Desirable Revision in the Organization of Track Maintenance; Construction and Maintenance of Highway Grade Crossings; and Various Methods of Ballast Cleaning and Renewal. In addition to the committee reports the Roadmasters' program included an address by H. W. Kellogg, division engineer, Chesapeake & Ohio, Detroit, Mich., on Reducing Unproductive or Travel Time of Maintenance of Way Forces.

The first speaker on the program of the joint session on Tuesday afternoon was J. P. Newell, general manager, Pennsylvania, western region, Chicago, whose subject was The Role of Supervision in the Present World Crisis. He was followed on the program by L. W. Horning, vice-president, personnel and public relations, New York Central System, who spoke in Personnel Relations As An Aid to Greater Efficiency. Following Mr. Horning came L. B. Harper, personnel assistant, Illinois Central, Chicago, whose subject was The Supervisor's Approach to the Safety Problem.

Following the close of the convention on Wednesday noon approximately 160 of those in attendance participated in a conducted tour of the recently remodelled frog and switch shop at Chicago Heights of the Ramapo Ajax Division, American Brake Shoe Company. This group also saw depth-hardening operations underway in the company's manganese foundry at that point.

In the election of officers, held at the closing session on Wednesday, Mr Halverson was advanced to president; A. H. Whisler, assistant engineer, Pennsylvania, Phila-

Convention Pictures

On these and following pages are presented photographs snapped in the Stevens hotel during the Roadmasters' and Bridge & Building conventions. Additional pictures taken during the meetings will appear in the November issue in connection with a detailed report of the Bridge & Building sessions.

J. P. Newell addressed a joint session on improving the quality of supervision

At a joint session L. W. Horning spoke on personnel relations and efficiency

L. B. Harper spoke on the supervisor's responsibility in accident prevention

C. Halverson
1st Vice-President

A. H. Whisler
2nd Vice-President

E. E. Crowley
Treasurer

Roadmasters' Association

Officers, 1949-50

A. G. Reese, president, district maintenance engineer, C.B.&Q., Galesburg, Ill.

C. Halverson, first vice-president, general roadmaster, G.N., Willmar, Minn.

A. H. Whisler, second vice-president, assistant engineer, P.R.R., Philadelphia, Pa.

E. E. Crowley, treasurer, roadmaster, D.&H., Albany, N. Y.

Elise LaChance, secretary, Chicago.

Directors

R. H. Gilkey, division engineer, C. of G., Savannah, Ga.

H. C. Koch, roadmaster, C. & W.I., Chicago.

F. G. Campbell, chief engineer, E.J. & E., Joliet, Ill.

G. L. Morrison, assistant engineer maintenance of way and structures, S.P., San Francisco, Cal.

H. W. Kellogg, division engineer, C. & O., Detroit, Mich.

O. H. Carpenter, general roadmaster, U.P., Pocatello, Idaho.

W. M. S. Dunn, general roadmaster, N.Y.C. & St.L., Bellevue, Ohio.

R. G. Simmons, general roadmaster, C.M.St.P. & P., Chicago.

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delphia, Pa., was advanced from second vice-president to first vice-president, R. H. Gilkey, division engineer, Central of Georgia, Savannah, Ga., was advanced from director to second vice-president; and E. E. Crowley, roadmaster, Delaware & Hudson, Albany, N. Y., was re-elected treasurer. Directors elected were J. E. Griffith, assistant chief engineer, maintenance of way and structures, Southern, Knoxville, Tenn.; and Paul Settle, assistant division engineer, Pennsylvania, New York.

Six subjects were chosen for investigation during the ensuing year, as follows: Proper Maintenance of New Rail to Increase Its Service Life; Benefits to be Derived From Properly Educating or Instructing Maintenance Personnel; Planning Required to Increase Productive Time of Maintenance Forces; Proper Operation and Maintenance of Roadway Machines and Work Equipment; Economies Derived From Use of Weed Eradicators; and Economies to be Realized in Handling of Ties.

Abstracts appear below of the addresses by Messrs. Aydelott, Newell, Horning, and Harper. The address of Mr. Kellogg will be presented in full in a subsequent issue. Complete versions of the six committee reports, together with brief abstracts of the discussions following their presentation, are also presented in the following.

PROBLEMS OF THE MAINTENANCE OFFICER

"The deep interest which I have always had in the maintenance-of-way department stems from an appreciation of the many handicaps under which your work is performed," said Mr. Aydelott in his opening address before the opening joint session on Monday. Track and bridge work, he went on, must, except in a few instances, be carried on under traffic and many of your problems are the result of this situation. These problems, he pointed out, because of shortening of train schedules, increased traffic on many single track lines and higher standards of maintenance will probably grow rather than diminish.

Mr. Aydelott then discussed certain measures which might provide relief in this situation, including stabilization of roadbed, greater use of off-track equipment, increased mechanization, higher standards for materials, improved methods of transporting men to and from work, and high standards of supervision.

The expanded research facilities of the A.A.R. which is investigating the behavior of basic materials used in track and bridges, were then discussed by Mr. Aydelott. "Most of you", he said, "in your respective territories have installations of a test nature, and too much stress cannot be laid upon these installations, since they may prove to be of extreme value not only to your company but to the entire railroad industry."

In closing Mr. Aydelott mentioned that the sharp upturn in business has created a serious car shortage. "To overcome the shortage," he said, "a great many things will have to be done to secure greater car utilization, and among these is the prompt release of cars in which you receive your materials."

SUPERVISION AND THE WORLD CRISIS

Mr. Newell's address on The Role of Supervision in the Present World Crisis, was divided into two parts. In the first portion he emphasized the importance of proper supervision, and of improving the quality of supervision to obtain better performance from the maintenance-of-way forces. Good supervision is necessary, he said, to assure that maintenance allotments are spent properly. From the supervisory officers in this department come the ideas and suggestions for assuring forward progress of maintenance-of-way practices. Such officers, he said, because of the location of many of them in outlying communities, are in an ideal position to develop local respect and appreciation for the railroads, and they are also the roads' first line of supervisory defense in wrecks, floods and other emergencies.

Speaking of the eagerness of management to develop better supervisors Mr. Newell recommended that his listeners read Elbert Hubbard's "Message to Garcia," and then listed six questions which he said "are basic and worthy of your attention." These are (1) Are you happy? (2) Can you distinguish between essentials and nonessentials? (3) Are you predictable under pressure? (4) Do you have per-

sonal integrity? (5) Do you accept your responsibilities? and (6) Are you loyal?

In the second part of his address Mr. Newell developed the thought that the things he had been discussing constitute a prerequisite for the role that supervision must take in the present world crisis. He then discussed some of the detailed problems that would be encountered by maintenance-of-way departments in the event of another world conflict, such as extremely heavy traffic, shortages of materials, and lack of manpower. However, he told his listeners that "you should know all the answers —both from your review of your experience, and from careful analysis of mistakes and errors in past experience."

Mr. Newell then mentioned "two new and very serious problems" that may face the railroads if war should develop, adding that these two problems will place a "tremendous responsibility" on the shoulders of supervision. They are, he said, (1) Possible sabotage; and (2) the possibility of explosive bomb and atomic bomb attacks, in view of the great developments in aircraft in the past five years.

PERSONNEL RELATIONS AND EFFICIENCY

"No program for all-out efficiency, regardless of how many machines it may provide, can be thoroughly successful unless it takes account of the men who are still the basic component in maintenance-of-way work," said Mr. Horning in his address before the joint session on Tuesday. "This," he went on, "is where personnel relations enter the picture. The pursuit of a personnel-relations program involves the forming and carrying out of policies conducive to good feeling and, therefore, to good work."

First, Mr. Horning declared, we are interested in seeing that the men working for us do a good job, and our prime task boils down to one of helping men do good work. To do this, he said, one must consider the things that a human being craves simply because he is a human being—such things as the desire for personal dignity, a need to enjoy a sense of accomplishment in his work, and the need of feeling that what he does is appreciated. Whether or not a job fills these three needs, he went on, depends largely on the attitude of the company, as expressed by the various levels of management and supervision, towards its employees.

Left to right—Blair Blowers, chief engineer maintenance of way; J. S. Parsons, assistant chief engineer maintenance of way; J. P. Morrissey, division engineer; H. J. Weccheider, engineer maintenance of way—all Erie

Mr. Horning then explained how the satisfaction of workers with their jobs can be brought about. Supervisors and officers, he said, should respect a worker as an individual; believe in their men; create respect by competence and leadership; explain frankly the reasons for certain policies; let employees know what's going on; offer commendation for a job well done; base all promotions strictly on merit; broaden the worker's field of activity if he is doing well at the job assigned him; delegate authority and use men to capacity; and listen to suggestions, questions and "gripes."

In conclusion Mr. Horning discussed how management is backing up the maintenance man's efforts toward greater efficiency through its endeavor to iron out some of the peaks and troughs of maintenance-of-way employment so that steady work can be offered to more men, through its encouragement of modernized techniques, and through its increasing interest in training men.

THE SUPERVISOR'S ROLE IN ACCIDENT PREVENTION

In discussing, before the joint session on Tuesday afternoon, the supervisor's responsibility in the prevention of accidents, Mr. Harper said that before supervisors can expect to put over a safety program they must first of all be sold on safety themselves.

Mr. Harper than discussed the role of supervisors as teachers, saying that no one can have the same prestige with workmen, or the same power to educate men in safety, as the man to whom the workers report. Therefore, the competent supervsor must have the confidence of his men and be so interested in them that he will have a personal desire to train them into the best possible workmen. "It takes a man with real executive ability to develop a safe, efficient and successful workman out of a potential failure," he declared.

Too many supervisors, said Mr. Harper, merely tell their men that rules must be observed and that certain practices must be performed rather than explain why it is to the workman's benefit to operate in a safe way. 'Selling safety", he went on, "is just like selling anything else. You will have to persuade the prospective customer that you have something that will benefit him, and that he will be better off after he has accepted what you have to offer."

In the remainder of his talk Mr. Harper disposed of the various excuses offered by some supervisors in defense of their poor accident records. To the man who complains that he can't watch his men continually, Mr. Harper said, "no one expects you to. The main thing is—what do you do about it when you see a safety violation." In commenting on the supervisor who says he doesn't have time to teach safety, Mr. Harper said "you don't have time to do anything else but teach safety. If we fail in safe operation, we have failed in everything else." For the benefit of the supervisor who complains that he gets tired of telling the same thing every day, Mr. Harper drew an analogy between the advertising business and safety work. "Advertising people", he said "know that the more times a product is talked about the better it will sell."

Highway Crossing Construction and Maintenance

Report of Committee*

• With the mounting number of vehicles using our highway crossings today and with special emphasis on the heavily-loaded truck traffic, the subject — "Highway Crossing Construction and Maintenance" is a very important one to every railroad.

As this committee interprets its assignment, our report is to include only highway crossings that carry a fair amount of traffic to those carrying extremely heavy traffic. Little-used crossings, such as those involving county, farm, and industrial roads are not included as it is felt that these present an individual problem and must be dealt with as such.

In a report presented at the 1934 convention of this association several types of crossings were listed as being adequate for use of both railway and highway traffic. In recent years most of these have proven unsatisfactory because their type of construction will not withstand the constant pounding of the heavy vehicular traffic of today, and at the same time insure the safe operation of high-speed trains through them.

Crossings for Light Traffic

The following types of crossings are no longer considered adaptable to highway use, but may be used to a good advantage on crossings with light traffic:

Monolithic Concrete—In monolithic construction, wherein the inner track devil strip is a poured slab and the abutting pavement is also a poured construction, a very severe problem is presented when the track surface settles, since it is impractical to cut down the devil strip and the abutting pavement to meet the track grade. This type crossing disintegrates rapidly under heavy wheel loads.

Metal-Rolled or Cast—This type crossing has proven too costly to maintain in order to keep it tight and noiseless and, when damaged, requires special fittings to make the necessary repairs, which are not normally carried in stock.

There has just recently been placed on the market an open-grating highway crossing. This new-type steel crossing has not been in service long enough to permit an intelligent report to be made as to its merits at the present time.

Rail Type—It is practically impossible to have a smooth-riding surface with this type of crossing. It is also too costly to remove and replace to do maintenance work on the track.

H. M. Overpeck
Chairman

Untreated Plank—Because of early decay of the wood, it is not considered good practice to install untreated timber in any permanent crossing.

Other Types of Crossings

The following types of crossings are recommended as indicated:

Precast Concrete — This type crossing, in certain locations, requires an excessive amount of maintenance in trying to keep the slabs tight and in place. It is also very difficult to maintain proper drainage with this type of crossing. During the winter months snow and ice accumulate under the slabs, which causes them to heave, creating a hazard both to rail and vehicular traffic.

Precast concrete slab manufacturers have surrounded the slabs with steel bands. This has helped to stop the slabs from deteriorating around the corners and edges to some extent; however, when the slabs start to deteriorate there is no practical method of repairing them. There is also no practical method of shimming the slabs when the crossing becomes out of surface due to heaving and settlement.

While this type crossing is not too practical in northern climates, it should be more practical in southern climates where frost action is not prevalent.

Treated Plank—This type crossing is still favored where traffic is not unusually heavy. Four-inch creosoted black gum timbers are recommended for most crossings, using creosoted timber shims of proper thickness, depending on the weight of rail.

Where it is necessary frequently to open up the crossing for spotting up or other reasons, timber crossings are the most practical. Since the planks are subject to becoming loose due to vibration, they are not as smooth as other types of constructed crossings. Conversely so, the planks are more readily restored to position or replaced; hence, surface over these crossings is more inexpensively maintained.

Asphaltic or Bituminous — This type of crossing has proven very effective where the traffic is not unusually heavy. There are several different methods used in constructing asphalt-mix crossings, and each has its place as to the amount of traffic it carries. The differences in construction are mostly in the timber framing of the crossings and as to the necessity of timber planking inside and outside of the running rails.

Installing Bituminous Crossings

When installing a bituminous crossing new slag or gravel ballast should be applied with enough material to cover the top of the ties. Ballast should be securely tamped and whenever possible train traffic should pass over the crossing to help settle the ballast, as it is very important that the ballast be firmly set under bituminous crossings. After ballasting a coarse bituminous mixture, not less than 6 in. in depth on heavy traveled highways, should be applied to within one inch of the top of rail; this mixture should be thoroughly compacted with a roller, then a finish coat of a fine bituminous mixture should be applied to the top of rail. This, too, should be thoroughly compacted.

Bituminous crossings have tendencies, inherent in the material, to corrugate or ravel. Ravelling next to the rail will create voids through which water is admitted. Unless these openings are filled in immediately, the pavement breakdown is accelerated..

The advantage of bituminous crossings over other crossings is that, with proper instruction, almost any section force can repair the crossing, employing a cold mix, hot bitumen or pitch with a small amount of sand. Sufficient quantities of these materials can be carried on sections without great capital outlay or loss through deterioration.

*Chairman of this committee was H. M. Overpeck, roadmaster, Elgin, Joliet & Eastern, Joliet, Ill.; vice-chairmen, J. S. Mills, track supervisor, Illinois Central, Fulton, Ky., and J. M. Keays, roadmaster, Canadian National, Matapedia, Que.

Left to right—S. H. Shepley, assistant chief engineer, E. J. & E.; E. M. Loebs, chief engineer, C. & I. M.; C. E. Winkler, roadmaster, Ill. Term.

F. W. Erck, roadmaster, T. & N. O.; R. L. Tuck, roadmaster, T. & N. O.; B. E. Glenn, roadmaster, M. P.

Experiments are now being made with a grouted ballast base over which is spread a bituminous mixture. This test is being made with the thought of sealing out sub-surface water and of supplying additional track structure support. The grouted sub-ballast should provide a solid durable base which would eliminate settlement by spreading the load evenly over the subgrade, and at the same time minimize rail flexure, thereby preventing pavement breakage and resulting maintenance.

A Crossing for Heavy Traffic

Pre-Fabricated Black Gum Crossings—This type crossing was designed for use in crossings carrying heavy vehicular traffic. A number of these crossings have now been in service for a number of years in crossings carrying unusually heavy traffic and have required little or no maintenance. The main factor in the service life of a pre-fabricated crossing is its proper installation.

The following recommendations are made for the installation of a pre-fabricated crossing.

(1) Ties—Crossties should be the same width as the crossing itself, in order to have a full bearing surface. Therefore, using 132-lb. rail with a 14-in. tie plate, the crossties should be 9 ft. 4 in. long. Creosoted hardwood sawed ties should be used and must not be adzed. Tie spacing for an 8-ft. standard crossing section is 19-$\frac{3}{16}$ in. Ties should be drilled ¾ in. for a 1-in. lag screw.

(2) Rail—All rail joints within the limits of the crossing should be welded if possible.

(3) Ballast—Crushed slag or stone ballast is recommended, and the top of ballast should be kept down at least 2 in. below the top of crossties.

(4) Lag Screws—One-inch lag screws are recommended for fastening these crossings to the ties. For sections 7 in. thick or under, the lag screws should be 10 in. long; for sections over 7 in. thick, lag screws should be 12 in. long. Lag screws should be screwed in place, never driven. Countersunk lag-screw holes should be filled with mastic after the screws are turned down tight.

Crossings—General

Drainage—The first requisite of a good crossing, regardless of type, is good drainage. Proper attention should be given the matter of drainage at all times. Elimination of water is the best insurance of maintaining a durable job. Permitting water to remain within the crossing will hasten its deterioration in addition to providing a rough riding track. Perforated pipe installed outside the ends of the ties and to a grade below the bottom of the ties will help materially in keeping the ballast section dry. The maintenance of any crossing will, in no small way, depend on whether it is effectively drained.

Ballast—When renewing an existing crossing, or installing a new one, careful consideration should be given the ballast section. Old ballast should be removed and new ballast applied to a minimum of 8 in. below the bottom of the ties, and should extend 2 ft. beyond the ends of the ties. When possible, the ballast shall be traffic tamped, then air tamped. The ballast should consist of slag, crushed stone or gravel to insure proper drainage. It must be remembered that the ballast provides the basic structure for your crossing; a weak or unstable ballast section may be the undoing of an otherwise good crossing.

Any grade changes anticipated in the near future should be given consideration at the time the crossing is installed, and the new grade set to the proposed elevation.

Rail—A look into the future rail renewal requirements should be taken into consideration when installing a new crossing. If you contemplate renewing your present rail section with heavier rail within the next few years, the heavier rail should be installed in the crossing and off-set at each end. In doing this, it will not be necessary to disturb the crossing during the rail-renewal program.

Welded rail should be installed through the entire length of the crossing, as joints are undesirable. The rail should be set in double-shoulder tie plates and double spiked.

Highway Approaches—Highway approaches are as important as the crossing itself. Too steep an approach not only is a hazard to motor traffic, but causes a heavy impact on the crossing, which in a short time will result in its being damaged. Long run-offs are suggested, the lengths of which are to be governed by the track grade above that on the highway. In most cases the run-off on the abutting highways must be made twenty feet to every inch the track is above the pavement in elevation. There should be no dips in the pavement between tracks; the pavement grade should slope from the top of rail of one track to that of the other.

Whenever any important change is necessary or any extensive repairs are to be made in any crossing, the highway officials should be contacted with the view of having highway traffic diverted while the work is going on. Not only can a more workman-like job be accomplished, but great savings in labor can be realized, if work is not performed under traffic.

Highway officials should, when possible, agree to divert traffic, as this will permit work on the crossing to be speeded up so that it can be released in about half the time that would otherwise be required.

Highway crossings should be carefully maintained at all times. Flangeways should be kept clean. Loose planks should be securely fastened at once. When patching is required in bituminous crossings it should be taken care of before the holes become too large. When plank crossings settle below highway level, they should be raised before they become loose.

Discussion

R. W. Putnam (S.P.) opened the discussion by requesting further information concerning flangeways for crossings. Committee Chairman H. M. Overpeck (E.J.&E.) stated he uses scrap rail for flangeways. R. L. Fox (Sou.), however, said that on his territory metal flangeways are not permitted because of their possible interference with track circuits. His preference, he said, is for prefabricated gum crossings with wood flangeways. C. Halverson (G.N.) then described briefly the method of constructing crossings used on his territory.

Replying to a question concerning difficulties experienced with bituminous crossings, C. A. Williams (F.E.C.) said that he has eliminated the use of timber abutments at the ends of bituminous crossings and now seals the crossing ends against water by rolling the bituminous material. He uses wood guardrails inside and outside the rails in such crossings, he said. C. E. Winkler (Ill. Term.) stated that, for bituminous crossings he uses neither wood nor metal flangeways, but compacts the material with a backfill tamper and permits train wheels to form their own flangeways. O. H. Carpenter (U.P.) said that his practice with respect to the construction of bituminous crossings is similar to that described by Mr. Winkler.

President Reese said that his road has had trouble with bituminous crossings without flangeways and now uses a solid timber guardrail thick enough to extend from the top of the ties to the top of rail. L. F. Lombardo (C.M.St. P.&P.) said that he favored a similar type construction Placing switch ties both inside and outside the rails for guardrails at bituminous crossings makes a real crossing, he said.

Desirable Revision in the Organization of Track Maintenance

Report of Committee*

• The need for revision in the organization of track maintenance has resulted from changed working agreements, vacation schedules, and the shorter work week, together with higher material and labor costs.

Labor as a whole has tended to get away from as much actual physical work as possible, utilizing the conveniences of the mechanical age. Improved roadbed through stabilization, treated timber, heavier rail, better quality and quantity of ballast, rail anchorage and improved rail fastenings, together with increased mechanical devices for drainage work, roadbed restoration and vegetation control, has permitted as well as required this change. Certainly a more permanent track structure should reflect itself in the revision of track maintenance forces.

As reported by the committee, the minimum and maximum lengths of main-track sections at the present time, are 8 to 16 mi., with 2 to 9 laborers working on each section during the summer months and 1 to 6 laborers during the winter months. Branch-line sections were reported to be as long as 25 mi. Rail reported ranged from 65 lb. to 132 lb. for main track and 56 lb. to 115 lb. for branch-line tracks.

This question was placed before the committee: "Is the section crew as we have known it outmoded?" The response to this question indicated a considerable difference of opinion as to the future status of

L. C. Blanchard
Chairman

this unit. The two most representative replies are quoted below.

By a division engineer on a southwestern road: "Yes; should be replaced by assigned district gangs with highway transportation or, if highways not convenient, construction of means of truck travel on railway property. This is being done on our lines. The motor track car is outmoded and the organization of district gangs is considered preferable, particularly if highways are conveniently close to the track to permit use of truck transportation."

By a chief engineer on a midwestern road: "I do not think that the section crew will ever be outmoded. By all that has been discussed before in the questionnaire, it is obvious that we are making that unit more efficient each day. It is true that we may be able to do without so many section crews by supplementing them with extra-gang forces. The responsibilities of a section force on every railroad are about uniform and so definite that it would be almost impossible to do without them. I refer mainly to the many chores and duties around the station, and on their territory that are not confined entirely to track maintenance. A lot of this is due to the territory through which the line runs, such as the feeding territory of the west where a good share of a section gang's time is spent in bedding and cleaning stock cars, or in and around a busy freighthouse where some of their time may be used in handling heavy freight. I do not favor the enlarging of a section force in a section territory, but rather, after the economical length of sections has been established, it is important to superimpose upon these territories a much larger territory for a fully mechanized gang. In any case, all forces in track maintenance work should be mechanized to the fullest extent practicable."

The general opinion, as indicated by all of the reporting sources, is that the section crew will continue, as in the past, to be the backbone of track maintenance, but in a more modified form. The section force is a trained core that can be quickly expanded when necessary and is the most flexible labor unit on the railroad.

The majority of railroads are now furnishing power tools for the use of section forces. Some of these tools are furnished to all sections by some roads while others hold them at headquarters and furnish them as the situation warrants. The members of this committee report using the following power tools to good advantage: Air

*Chairman of this committee was L. C. Blanchard, roadmaster, Chicago, Milwaukee, St. Paul & Pacific, Minneapolis, Minn.; vice-chairmen were J. H. Desjardins, roadmaster, Canadian National, Quebec, Que.; O. C. Prewitt, roadmaster, Texas & Pacific, Marshall, Tex., and W. F. Baker, roadmaster, Chicago & North Western, Huron, S. D.

E. J. Brown, engineer of track; H. R. Clarke, chief engineer; H. L. Carlson, chief clerk—all C. B. & Q.

C. E. Peterson, assistant engineer, A. T. & S. F.; J. B. Wilson, chief engineer, A. & W. P.; H. L. Slemp, roadmaster, A. C. L.

powered or electric powered ballast tampers; rail saw; rail drill; bolting machines; off track mowers; grinders; adzers; spike pullers; spike drivers; discers; joint oilers; power rail layer; yard cleaners; weed sprayers; trucks of various types; tractors furnished with two wheel trailers and equipped with rotary snow broom, mower, post-hole digger and other attachments.

Although opinion differed, the majority stated that if they were allotted 45 laborers for 15 sections, they would use 10 to 15 of these men in a specialized gang and divide the balance among the sections. Each section foreman with two laborers would take care of the chores and spot conditions while the specialized gang concentrated on programmed work. The committee feels that maintenance costs on branch lines could be reduced as much as 40 per cent by the use of heavy rail and good ballast.

Small Floating Gangs

Most roads are giving serious consideration to the use of small floating gangs to be fully mechanized and transported by truck. One of the committee members has stated the matter most capably as follows: "We have at this time on our railroad 5 truck gangs each having a territory of 40 mi. with the exception of the 2 that are located at terminal points at each end of the line. Due to the time that would be lost, the latter two gangs' territories are confined to 20 mi. out of their terminals. The other three gangs having the 40-mi. territories are located in the center of that assigned to them. The average number of men in these truck gangs is 15, and the gangs are used on all heavy maintenance work to complement the section forces. This saves doubling up section gangs with the resulting loss of supervision and it is also possible properly to transport tools and equipment.

If all of these men were prorated among the section gangs, it would mean the necessity of doubling up section gangs for all heavy work with a considerable loss in travel time, for all of our section forces still are transported by motor car. Also the greatest share of the work done by section gangs can be handily done by a foreman and two men and any additional men would be a waste of man power. Such a 15-man gang could be furnished with either air or vibrating tampers, depending upon the kind of ballast used, four high jacks and two low jacks, a rail saw, a bolter and the truck to be equipped with a power winch. The sections in this territory are 10 track-miles in length."

It seemed well agreed by the committee that a 15-man gang was a most economical and efficient unit. There is a limit to the number and variety of power tools that should be furnished a gang of this size so that good judgment will need to be exercised with respect to the job to be done.

Short stretches of unstable track can be most economically handled by the section forces—longer stretches by floating gangs. For the long run the most economical thing would be to stabilize the track by the use of heavier rail, better ballast, proper drainage or grouting, as might be required.

Track Inspection

A lengthy questionnaire was given members of the committee with regard to patrolling and inspecting the track. As might be expected there was a wide difference of opinion as to how this work should be handled, considered from the standpoint of both safety and economy.

A few railroads have the section foreman and two or three laborers patrol the track daily except Sunday. A few other railroads have the track patrolled by one man on a light inspection motor car covering from 30 to 100 mi. each day, who has general supervision of track forces in his territory. Several more railroads are considering setting up this long patrol, while some others having tried it, have discontinued it or are planning to. Analyzing all of the reports submitted, and information from other sources, it appears to this committee that the overall trend is in the direction of longer sections with smaller crews in which the section foreman and one laborer will make a very careful and detailed inspection of the track on Monday and again on Friday, correcting any unsatisfactory or unsafe conditions as may be found.

If the force consists of more than one laborer the forman would ordinarily drop the other men off at some point to do necessary work while he continued on over the balance of the section with the one man. In this way responsibility would be absolute while at the same time he would have the tools and the help available to cope with almost any emergency. During the balance of the week considerable patrolling would be done in the normal course of his work, together with the help received from other people traveling over the railroad. Most railroads do not patrol on Saturdays, Sundays, or holidays except when some unusual condition exists.

In general, most railroads handle the matter of patrolling the same for light rail as for the heavier rail, thought being that in each case the rail is adequate for the traffic over it. When the rail or roadbed is not adequate special consideration would have to be given.

Some felt that a walking inspection of the track should not be expected or required of the section foreman; however, the majority were in favor of such an inspection to be made once in each 30 to 90-day period. No member of the committee expressed himself as being in favor of discontinuing all regular track patrolling and depend on train crews, linemen, signal maintainers, division officers, etc., to note and report track defects.

This question was put before the committee: "Under what condi-

R. G. Simmons, general roadmaster; L. C. Blanchard, roadmaster; L. R. Shellenbarger, assistant engineer—all C. M. St. P. & P.

R. F. Harris, roadmaster; J. R. Kanan, assistant engineer of track—both C. & S.

tions could regular section crews be dispensed with entirely and the work carried on by gangs using trucks on roads paralleling the tracks as well as other off-track equipment?"

It was agreed by the committee that this type of organization could be made effective in certain territories where the tracks were accessible by highway, but on the whole was not desirable because most of the advantages are offset by the disadvantages. Highways do not normally favor such a set up by their locations and there are too many small jobs that cannot be handled efficiently by an extra gang. One committee member who had actual experience with this set up remarked as follows: "The track patrolling was done by an assistant foreman and one or two men with a light motor car. We have kept up track to normal and gained in quantity and quality of out-of-face work. The only weak point encountered has been in the matter of policing, which was formerly accomplished by the section forces. Gangs consisted of about 15 men (limited by passenger capacity of ordinary van-type truck). Gang can handle about 40-mi. assignments, 30 mi. where highways are not conveniently located and 45 mi. where highway locations are favorable. The roadmaster instructs the foreman according to the nature of the work in hand. Ordinarily a weekly line up would be sufficient, but instructions would necessarily be flexible and foremen should be expected to exercise judgment of his own to fit weather and special conditions."

How should the work of renewing angle bars and tightening bolts be organized? To this question came a variety of replies. Where the work was not out-of-face most felt it was the business of the local section force. For out-of-face work some advised that a successful organization was composed of two bolting machines, five laborers and a supervisor. For really heavy going one maintenance engineer who has given this matter a great deal of study put in this way: "This work should be handled by a system gang under a general officer, as it is not a division affair. The gang should consist of 20 men and one foreman and should be equipped with six bolting machines, one rail puller and a 1½-ton truck. Cost figures have proven this is the correct way to get it done." The fact that a gang is organized on a system basis does not absolve local officers from responsibility in seeing to it that the work is properly done.

Organization of Welding Gangs

How should welding gangs be organized for building up rail joints, frogs, switches, etc.? As one committee member put it, "there are so many controversial points concerning handling of welding on most roads that it would involve a report of its own." For the purpose of this report we will go into it only briefly. Welding gangs should be organized on a system basis under a general officer, who would outline territories to hold travel time to a minimum. Two to four men engaged in welding frogs and crossings should be provided with a 1½-ton truck and house trailer. Rail-end crews should have on-track equipment and would have 10 to 18 men.

The weed problem is an annual headache to most supervisory officers. It is common practice by the majority of the railroads to use on-track mowers for the weeds on the track shoulders. Most of the roads do not attempt to cut farther out than 10 ft. from the center of the track with these on-track mowers. These mowers are operated with a crew of three men, generally on a division basis, and are given protection while on the track. The majority of the committee members seemed to favor using flag protection. Also most roads favor the use of company-owned tractors, with railroad personnel to operate them, for mowing station grounds and right of way in preference to contracting this work.

For the ballast section of the railroad, most roads use weed burners, steamers, or work trains spraying chemicals under pressure. Each method is effective but costly. For the balance of the right of way most railroads either mow it or burn it off in the fall or spring except where legal considerations require certain classes of vegetation to be controlled. For small isolated spots the section crew can best handle these with one of the recommended chemicals.. Where the right of way is extensively infested the use of a pressure tank mounted on a heavy duty push car pulled by a motor car has proven effective. This outfit has booms extending out 25 to 40 ft. and has an independent hose connection that will reach out 50 ft. or more. One operator goes with the machine and extra help is provided by the section crew on whose territory the work is being done. Where traffic prohibits the use of this equipment a tractor can be used effectively but it cannot cover the ground as rapidly. Work of this nature cannot be handled with work trains as economically as with the smaller unit. In many places there are men equipped to do custom spraying, who can contract this work for less money than a railroad could do it with its own forces. Some counties have equipment they will hire out on a cost basis that is well worth investigating.

Making Repairs to Fences

A few railroads and some divisions of other railroads have been successful in getting farmers to repair or rebuild the fences along their property, simply by furnishing the material. This is something that takes a lot of promoting and cannot always be done. For ordinary maintenance and replacement the section force is well equipped to handle the work. The section crew can be expanded as necessary. New men hired for this work usually have a better understanding of building fence than any other work on the section so that a minimum of supervision is necessary on the part of the section

A. B. Hillman, Jr., track supervisor, I. C.; A. B. Hillman, assistant chief engineer, C. & W. I.

H. E. Kirby, cost engineer, C. & O.; C. G. Grove, chief engineer maintenance of way, Western region, P. R. R.

foreman. Aside from the ordinary tools used in this work a self-contained hammer of the type of a paving breaker with driving heads, and, in case of wood posts, a clay spade and moil point for use in hard ground or rocky soil would prove practical. In case of extensive repairs a power auger would prove most economical. Where it is planned to build several miles of new fence out-of-face a specialized gang should be considered. For ordinary spot repairs the section crew can handle this work to best advantage in the early spring or the late fall.

Maintaining Motor Cars

The maintenance of motor cars and other power equipment came in for a good deal of discussion by the committee and it was generally agreed that section foremen should not be required to make other than minor repairs. Some roads have a motor-car repairman on each division, who in some cases is furnished a panel truck to make field repairs. Those using this system seem to like it. However, some railroads depend on the section foreman to keep his motor car running as long as he is able to by making minor repairs and adjustments.

When the motor requires major repairs, a replacement motor is furnished, and, where necessary, a complete car. About once a year a traveling motor-car inspector visits the section foreman in company with the roadmaster. The car is given a careful inspection and any trouble the foreman is having with it is ironed out at that time. For roads having a majority of mechanically-minded section foremen this seems to work well enough. The merit of this system is that each foreman is made to feel his responsibility in maintaining and careful use of the equipment assigned to him. Extra gangs are provided with a mechanic, known as a machine operator, to keep power tools operating satisfactorily.

The roadmaster has direct supervision over all track forces and special equipment forces while assigned to his track division, controls the number of men worked on each gang, supervises preparation of all reports rendered by such forces and is responsible for maintenance of track, roadbed and culvert structures and patrol, inspection and policing of company property. He should be allowed to organize his own schedule of activities.

The Roadmaster's Activities

The roadmaster should plan the work of the section foremen so that each foreman will be engaged in the general program or schedule assigned to that district. The section foreman should be expected to have the necessary training and aptitude to carry out the program to get the results desired.

Within the scope of this plan the section foreman should be allowed some lee-way to use his own judgment and initiative. Too close supervision can ruin a good foreman while failing to develop the others. After instructing the foreman as to the scope of the work, he should see that any material or equipment needed to carry out the work is made available, review the details involved to confirm the foreman's understanding on what was wanted, then leave the gang foreman free to carry out the work

Each roadmaster should strive to effect a close working relationship between himself and all of the division staff. No one can run a territory all by himself. It takes all of the staff working together to do an effective job.

Summary

In conclusion it is unfortunate that desirable revision in the organization of track maintenance cannot be set up in a pat formula that would be suitable for all railroads. There is too much difference in climatic conditions, financial ability, density of traffic, roadbed standards, etc., for this to be possible.

The recommendations included in this study are based on average conditions and can be of benefit to the maintenance officer only as he considers them in the light of his own problems.

In reorganizing our forces we should bear in mind that there is only one kind of time that has value and that is productive time. Travel time, idle time and inspection time should be reduced to a minimum consistent with safe operations.

Discussion

The discussion that followed this report dealt almost exclusively with the methods, problems and effectiveness of patrolling track by motor car. In reply to a question asked by R. G. Simmons (C.M.St.P.&P.), C. Halverson (GN) gave a comprehensive outline of the track-inspection system on his road under which track inspectors patrol 50 to 80 mi. each day on light motor cars. These men are away from home every other night for which they are allowed expenses. He also pointed out that many trucks are used on his road by district gangs. Their use, he said, attracts a better class of labor, and assures that the men get to and from work faster, resulting in more work being done.

R. L. Fox (Sou.) questioned whether a track patrolman who had to cover as much as 80 mi. a day could make more than a casual inspection of the track. He said he thought such men "ought to set their feet on a few ties" once in a while to obtain a true picture of maintenance needs.

F. H. McKenney (C.B.&Q.) reported that he has been getting good results for more than 15 years from the motor-car inspection system, and plans to expand it to cover additional territories. C. R. Wright (N.Y.C.&St.L.), as well as Mr. McKenney, indicated that one of the big advantages in using the one-man inspection system lay in the effectiveness it gave to the inspection of switches, including the filling of switch lamps.

Improved Methods Used in Surfacing and Raising Tracks to Grade and Line Stakes

Report of Committee*

• Comprehensive handling of this subject would require evolving the surfacing operation from the initial staking of the grade and line to the final lining. Time would not permit such coverage so the line and grade-staking features will be commented upon only briefly as they are purely engineering matters.

The responsibility for setting grade and line stakes rests within the engineering department. In some instances it is practical for the roadmaster or track supervisor to do this work, but it is not recommended that he be required to do so because it takes too much time from other, more important duties. The real economies result from the actual surfacing work, and the full attention of the roadmaster or supervisor should be directed to this phase to realize these economies to the utmost.

The supervisory officer who decides on locations to be surfaced should arrange for the engineering party to run the rail profile, project the new grade line and stake the track. Under certain conditions it is not necessary that stakes be set because a competent section foreman, correctly using his spot board, can often satisfactorily surface track without stakes, but when adjustments in grade are needed the track should be staked. Stakes should be placed approximately gage distance from the line rail on tangent track or the low rail on curves every one hundred feet, and the points, quarters and mid-points of vertical curves should be staked. Where it is practical the top of stake should be at the same elevation as the proposed top of rail so the foreman can place his spot board directly between stake and rail.

The string line methods of lining curves will give good results, providing the measurements, computations and staking are done with care. The realinement of curves with a transit will produce mathematically correct curves, but it is not always practical to make a transit survey on account of terrain difficulties. It is recommended that tangent points, spiral-curve points, and points of compound curve be marked with monuments

*Chairman of this committee was L. W. Howard, assistant valuation engineer, Illinois Central, Chicago; vice-chairmen were E. T. Delaney, supervisor of track, New York Central, Lyons, N. Y. and H. C. Arnold, roadmaster, Chicago, Burlington & Quincy, Denver, Colo.

L. W. Howard
Chairman

to make maintenance and future staking simpler. Any curve badly in need of lining should be lined prior to surfacing.

The Surfacing Program

The division supervisory organization should make recommendations to the district engineer or engineer of track regarding the mile post locations of track to be surfaced in the following year. The longer portions can be fitted into the on-track machine program, if the locations are practical from an operating standpoint, and the shorter parts, or portions on territories not suited to the use of on-track machines, should be worked with district forces using individual tools with an off-track machine. Yard surfacing to be done should be determined by the supervisor and the work should be carried out as he directs.

Making Tie Renewals

Selecting the method of making tie renewals is one of the most important features in the surfacing work. The work of renewing ties is most economically done by the surfacing gang when the track structure is raised on the jacks. This speeds the work of changing out ties and reduces the labor cost per tie renewed over the cost obtained with the "digging-in" method.

The renewal work in connection with on-track machine surfacing is handled in two different ways. In one method the surfacing is completed in two raises, the first of which is a tie lift of three to four inches, during which the track is tamped on the old ballast. In this first raise, the ties are renewed and spaced and the anchors are set up. Foul ballast is then removed from the cribs, new ballast is unloaded and the second raise to final grade is made, after which the track is lined and dressed. This method is used where sufficient force is not available to make a complete job in one raise, where the ballast is exceptionally foul or cemented, or where tie renewals are too heavy for the force available. To gain maximum results the force must be large enough to keep the tamping machine working continuously.

Traffic moving over the track between the first and final raises will result in more uniform tie beds being formed prior to the second raise, especially where considerable tie spacing is needed in the tie-renewal work. Where ballast is foul the first tamping tends to break up compacted ballast, resulting in a better final surface.

The other method of renewing ties is similar to the first except that the ties are renewed during the single surfacing raise. This requires a large force to keep the job working at maximum capacity, and the size of force available is the governing consideration. Again, to gain maximum results, the tamping machine must operate at full capacity, and the number of tie renewals and the ballast condition are factors influencing the size of force needed.

When the single lift method is used the regular tamping gang should be followed by a small spotting gang to remove slight irregularities. This should give a good final surface, and doing the work in a single raise will develop increased footage of track tamped to final grade at a lesser increase in man-hours over the method requiring two raises.

Maximum footage without sacrifice of the quality of surface is the goal to be attained and, because fully-mechanized surfacing is in the development stage, further study should be made with standardization of methods in mind. Tie renewals should be carefully made and much study should be directed to this phase, searching for the following: The effect of short-term life remaining in ties left in the track on the last-

ing quality of the surface; the long-run cost of removing ties with remaining service lives of three to five years; and the overall effect of repeated surfacing on total average tie life with respect to renewing ties of remaining lives of three to five years at each surfacing.

Machine Surfacing

The machines available for surfacing are of three general types: (1) On-track machines with machine-operated and controlled tamping mechanisms; (2) individual hand tools operated by air or electricity from a separate power plant which can work either on or off track; and (3) unit tampers.

Traffic volume and the availability of the track to maintenance of way forces, size of force available, track-feet of surfacing to be done, number of tie renewals, and condition of the ballast are all factors to be considered in making the assignment of a type of machine for a surfacing job.

On-track tampers will generally be worked most economically under the detour method or on single track where traffic is light during the hours the machine is working. The use of an on-track machine requires a large force which should be especially organized to work at surfacing exclusively. That force should be housed in a camp and mobilized so that it can move from job to job, and should be equipped with machines necessary to produce the best results, such as power jacks, tie cutter, ballast cleaners if needed, on-track tampers, spot tamping outfit and ballast-dressing aids. The whole gang should be supervised by a general foreman who is especially suited to handle surfacing work of all types.

Small-scale surfacing jobs should be handled with local extra or section gangs using off-track machines. Production speed can be increased with the use of two or three four-tool outfits. With average tie renewals (4 or less per 39-ft. rail) the following number of men is recommended:

2—handle jacks
1—pull spikes and knock off anchors
5—renew ties
2—space ties, using spacers
8—cross tamp ties
1—keep power lines straight and push trailer
4—fill in for tampers and nip ties
4—tamp centers with forks or third tamper outfit
2—spike up and put on anchors
4—fill in and dress

33—Total

This organization should tamp seven 39-ft. rail lengths of track per hour of work, and it is desirable to have one foreman and at least one assistant supervising it.

J. W. Carpenter, track supervisor; E. E. Crowley, roadmaster—both D. & H.; J. R. Scofield, assistant district engineer; F. H. Simpson, engineer maintenance of way —both N. Y. C.

Lining can best be done early in the morning when light conditions are most favorable, or at times when the track is not available because of traffic.

For a small gang using one 4-tool outfit, doing single-face tamping with tie renewals not in excess of four per rail, the following number of men is recommended:

1—handle jacks) space ties
2—pull ties)
3—cut out beds and pull in ties
4—tamp ties
2—nip ties and fill for tamping
2—spike and gauge
2—fill in track

16—Total

For four-face tamping with the above gang, add two to four men with forks to tamp inside the rail and work the power tools for double face tamping outside the rail.

Both of the smaller organizations listed above can be modified to suit local conditions.

One committee member reports 2,400 ft. of track surfaced in an eight-hour day with a 20-man gang using one power jack and an on-track tamper. The result was made when there was no tie spacing or renewal work, but this same gang surfaced up to 1,600 ft. per day making light tie renewals of not more than two ties per rail. The addition of two men per tie renewed per rail should allow this force to keep up its production at the maximum rate.

For large-scale surfacing work under the detour method, with a properly organized and mechanized force using on-track machinery, large savings can be developed by the reduction of man-hours of labor required. Your committee has a report of a track gang of 140 to 150 men working under the detour method, and comparative results of doing the same work with smaller gangs under traffic. The gang organization is shown in detail in that report and an on-track tamper was not in use in that work. Its use would have reduced man-hours still further and caused more saving than was developed. The developed cost with the large gang for the detour method, compared to the small gangs working under traffic, indicated a saving of approximately 50 per cent. Under the detour method the track is taken out of service between permanent or temporary crossovers and turned over to the track gang during regular working hours. The use of temporary crossovers should be thoroughly considered, as the cost of the installations must be applied against the cost of the miles surfaced as well as any additional expense of train operation.

Surfacing on another eastern railroad has been carried through completely under the detour method with a force of 130 men, in which 40 men were used cribbing out and cleaning ballast, 60 men renewing ties and surfacing, and 30 men lining and dressing. This gang used two cribbing machines, 9 small ballast cleaners (5 working the intertrack space and 4 working the berm), one track crane to place ballast cleaners at desired locations, two on-track tampers and one air-compressor with two air hammers. This work was done using separate extra gangs for the cribbing, the tie renewals and surfacing, and the lining and dressing. If the use of section forces had been necessary they would have been assigned to the cribbing or the lining and dressing because the actual surfacing raise is done most economically with the extra gang, which has been specifically organized for that work.

Example of Large Savings

On another eastern railroad on-track machines have been in use for several years and they are producing savings of approximately $800 per mile over methods involving the use of off-track machines. Each machine in use is giving approximately one-half mile of surfacing per day and when working under the detour method in double-track territory it is the practice to work the machines in pairs, starting the machines back to back in the middle of the job

J. W. Wiggins, engineer maintenance of way; H. Homans, assistant division engineer; H. A. Thyng, supervisor work equipment; L. F. Brean, track supervisor—all Maine Central

and working from each other. This work is done under a general foreman and the typical organization has 31 men per machine worked, which includes a foreman, 2 assistant foreman, water carrier and two flagmen. When two machines are worked simultaneously the general foreman and flagmen work common to both machines. The work described is for the final surfacing raise after the ties have been renewed and spaced and the ballasting has been done.

A power jack is used to raise the track to just below final grade, and 40 small jacks, which are placed under the tie ends, are used to make the raise to final surface. This operation requires a foreman and assistant foreman and 13 men —one handling the level board, one operating the power jack, one digging jack holes, eight raising track and handling small jacks, and two carrying jacks from behind the tamper.

The machine has one operator, and four men feed ballast to the tampers. Follow-up work such as the tamping of insulated joints and through switches is done by an assistant foreman and four men, using a pneumatic tamping outfit with individual tampers. Two men adjust rail anchors. In addition to the 31 men mentioned above the track is lined by a separate gang of 12 men.

These organizations are used where track stretches of 10 to 25 mi. are to be surfaced out of face, but no limitations has been placed on the minimum length of track to be surfaced and they are often used profitably on stretches of five miles or less.

Another Example

On a midwestern railroad where the use of on-track tampers is quite extensive good progress has been made toward standardization of methods. Ordinarily the work is progressed by making an initial lift of 3½ in. with a power jack, at which time the ties are renewed and spaced, and the on-track machine tamps the track on the old ballast. For the second raise, foul ballast is removed from the cribs and enough new ballast is unloaded to provide for the final surface raise. The second raise can be made by the same gang, or, if two machines and a large enough force is available, the operations can be carried on concurrently with sufficient distance between the groups to allow for cleaning cribs and unloading ballast.

Their studies of results indicate that one on-track tamper performs the work of 24 men, and the operating results showed that in 1948 11 machines tamped 363 mi. of track at a saving of $221,809 over methods previously used, or $611 per mile. That road also reports that the finished work produced, because of more even compaction, is superior in quality and durability to that attained in hand tamping.

Production

In making the first raise, average production amounted to 1,720 ft. of track per day and in the final surface raise nearly 3,000 ft. per day was the average. The lower production in making the first raise was attributed to the fact that ties could not be renewed fast enough to keep the machine operating continuously, but this is now being studied with the view to revamping the gang organization to enable the whole operation to be carried out in one raise. This will realize the full potentialities of having the track tamped only one tme, while still getting maximum productivity of the machines.

An organizaton of that type should be supervised by a general foreman, one foreman, three assistant foremen and a timekeeper, and consist of approximately 100 men. They should be equipped with skeletonizing machines, power jack, power tamper and portable tamping units. Again, the best results will be obtained if the gangs are so organized that each man in the gang can work continuously in the same job.

Track lining can be improved with the use of a track-lining instrument and the results obtained are very satisfactory. The use of such devices makes slight irregularities in gage very noticeable and when they are used, track should be in good uniform gage or it should be made uniform. The instrument referred to is a transit type instrument which is set up over the gage line of the line rail and sights taken between a correct foresight and any intermediate point, through the use of a target carried by the lining gang.

Supervision

The responsibility for supervision and results rests directly on the roadmaster or track supervisor. He should constantly be on the alert to prevent lost motion in the gang and should attempt at all times to keep his work at the most productive level, which is realizing the full potentialities of the machinery used. After that goal has been obtained he can then look for possible reduction in the forces engaged in other phases of the job than the tamping. The keeping of cost records is an important part of the supervisor's duties because examination of such records indicates to him just where his program may be bogging down. Such records are valuable to system officers as an aid to standardization of the methods of using available machines, and for comparative studies of work under varying conditions existent on their systems. Information furnished by the supervisor should be accompanied by generous notes explaining local conditions affecting the whole operation.

The standardization of methods suitable to local conditions is the desired objective and it is recommended that further study of mechanized surfacing be made in the future because the work is yet in the development stage.

Discussion

Much of the discussion of this report was focused on the use of on-track tampers on single-track railroads. In reply to a question by E. M. Loebs (C.&I.M.), C. Halverson (G.N.) stated that on his road such power tampers were used, sometimes in tandem, on single-track lines over which 12 to 14 trains operate during the 8-hr. working period. It was the consensus of other members speaking from the floor that on-track tampers could be used effectively in single-track territory whenever 30 min. were available between trains.

Methods of Organizing, Equipping and Operating Rail-Renewal Forces

Report of Committee*

• The subject we have under consideration in this report is very timely and presents a situation which faces all railroads. Therefore, we have attempted to present, in a general sense, a resume' of a type of rail renewal force which we hope will present some hitherto unknown facts to this group, and which will be beneficial to you as a whole.

In considering this subject the scope has been restricted to cover fully-equipped system or regional rail renewal forces only—such forces to be organized and equipped so as to make it unnecessary for any part of them to drop back and help with any other operation, but to move forward as a unit, completing one line of rail at a time. Consequently, we will not discuss the relative merits of small forces such as bunched section gangs and small extra forces with a minimum of equipment used for smaller programs or special conditions.

Further in restricting the subject this report is confined to the installation of 39-ft. rail on new tie plates. There are certain definite steps or individual operations in connection with out-of-face rail renewals, which will be referred to throughout the report and which are listed as follows: (1) Unloading new rail; (2) Unloading spikes, bolts, washers, angle bars, tie plates, tie plugs and rail anchors; (3) Coating rail ends and hanging angle bars; (4) Cutting bond wires and knocking off rail anchors; (5) Unbolting; (6) pulling spikes; (7) lining out old rail and throwing out scrap; (8) driving down spike stubs; (9) lowering ballast for adzers; (10) driving tie plugs; (11) adzing; (12) creosoting (13) setting on new tie plates; (14) setting in new rail; (15) distributing track material; (16) bolting; (17) gauging; (18) drilling spike holes; (19) driving spikes; (20) applying rail anchors; (21) bonding; (22) tamping swinging ties; (23) gathering scrap; (24) loading scrap; (25) loading old rail.

It is the general practice of railroads consulted that steps 1, 2, 24 and 25, which require a work train, should be performed by local section or small specialized forces,

P. R. Matthews
Chairman

new rail and small materials being unloaded prior to actual laying of the rail and scrap and old rail being loaded after rail renewals are completed. However, some railroads find it economical to operate a loading gang immediately behind the rail-renewal force while the track is out of service. This loading force consists of one or two cranes to load old rail and a larger crane with magnet to handle scrap. The cranes and operators follow the rail gang and the necessary labor is recruited from local forces at the particular location.

Step No. 3—Coating rail ends and hanging angle bars—can be performed before the track is broken and most railroads do so, using local section forces. It is generally agreed that this operation should be performed not more than a day or two before the rail is laid account of dirt and cinders fouling the rail ends. Under particularly bad conditions, it should be performed at the time the rail is being laid. There is one exception where it is considered economical to perform this operation with the entire rail-renewal force, that is, where the track can only be broken to lay rail between definite periods in the day due to scheduled trains, and work can be planned in advance.

In carrying out step No. 15—Distributing track material—small materials such as spikes, bolts, washers, tie plugs, rail anchors, etc., are usually distributed at the time rail is being laid, because a large percentage of them will be lost in the ballast if distributed in advance of actual rail laying. Tie plates, however, are generally distributed prior to rail laying by section or extra forces.

Step No. 9 is not a necessary operation, if ballast between the ties does not interfere with the adzer machines. It also can be performed by local forces prior to rail laying. However, there are cribbing machines which can be worked in conjunction with rail renewals that are both practical and economical.

Step No. 18—Drilling spike holes—is an operation very few railroads consider essential in making rail renewals, but some of the railroads, which have developed such highly-mechanized rail gangs, feel that the advantages gained by drilling for spikes more than offsets the cost by improving gage and lessening fibre damage to ties.

Step No. 22—Tamping swinging ties—is usually performed by local section forces after the rail gang has moved on, but this is more or less dependent on the condition of the track and the practices of the individual railroad.

Step No. 23—Gathering scrap—is not necessary in connection with the actual rail renewal and the method of gathering is dependent on the method of loading and disposition to be made of it. However, the entire rail gang can be used to gather scrap when rail laying is temporarily halted. This operation is not generally set up to be performed by the rail renewal force.

ORGANIZING

In organizing a rail-renewal force there are definite factors that must be taken into consideration, such as size of the annual rail-renewal program, equipment to be used, restrictions as to when rail can be laid due to climatic and heavy seasonal traffic conditions, etc. Careful consideration should be given to these factors as well as any other unusual conditions which will govern the size of the rail gang. Another important item is quality, and no phase of the work should be neglected because of lack of labor. The size of a fully-equipped rail renewal force organized to perform all operations as a unit depends on the number of power units to be operated and usually requires 90 to 150 laborers, including operators, to perform steps Nos. 4 through 20, balanced so all operations are completed at approximately the same rate of speed. The 90-man force would be expected to average about 40 rails per hour actual laying time, while the 150-man force should lay 70 to 90 rails.

Too much emphasis cannot be placed on supervision and specific attention should be given to selecting a capable man to head the

*Chairman of this committee was P. R. Matthews, assistant division engineer, Chesapeake & Ohio, Ashland, Ky.; vice-chairmen were F. L. Etchison, engineer maintenance of way, Atlantic Coast Line, Savannah, Ga., and T. L. Williamson, roadmaster, Southern Pacific, Alturas, Cal.

A. W. Schroeder, chief engineer, C. & E. I.; F. H. Cramer, bridge engineer, C. B. & Q.; W. C. Oest, principal assistant engineer, F. W. & D. C.; W. S. Broome, assistant chief engineer, C. & S.

rail-renewal force. He should be given a title befitting his responsibility and have complete authority over the force to see that the rail is laid to standard in every respect. His title should be no less than assistant supervisor, or assistant roadmaster. In addition, sufficient foremen and assistant foremen should be provided properly to supervise every aspect of the work. The force should under most conditions be a mobile force housed in camp cars.

Very few railroads lay rail 12 months a year due to the size of the rail-renewal program, climatic conditions, heavy seasonal traffic, etc., and unless other work is found for the rail gang when not laying rail, and it is broken up, all the advantages of organization are lost. To eliminate reorganizing a new force at the beginning of each rail-laying season, the force should be kept intact or organized and equipped so it can be broken into small units for other work in the off seasons and reassembled to lay rail when needed. The cumulative experience gained by laborers and operators doing the same type of work day after day and season after season is one of the advantages of the system or regional rail-renewal force and every effort should be made to hold the organization together. It not only pays off in production, but the quality of the work can be controlled, usually for the better.

It is desirable and important to have a welder and work-equipment mechanic, or mechanics if necessary, assigned to the force at all times to insure proper operation of the machines without breakdowns and delay to the gang and the work. Special provisions should be made to permit mechanics to service the machines before work time to insure the proper condition of machines in the morning when the force starts out. A welder is indispensable for repairing machinery and can also be used to cut rail where permitted to do so by the management.

The signal work necessary in connection with rail renewals can either be handled by a system or divisional force, which ever best suits the individual railroad, however, it is usually taken care of by division forces. Regardless of which is used, the signal force is not considered a part of the rail-renewal force in this report and it is not discussed as such.

Inasmuch as the rail-renewal force is usually a transit force, every effort should be made to make living conditions as comfortable as possible by providing a hot noon-day lunch either on the cars, if practical, or delivering same to the job. Particular attention should be given to the quality and preparation of meals. Provision should also be made for periodical trips home.

If the force is properly organized, all the advantages of quality and production can be obtained that are possible in factory assembly-line methods. Obviously in this case the men and equipment move along and the work is fixed, but if properly equipped and organized in the correct balance, a smooth efficient operation is possible.

EQUIPPING

In the last few years the improvement to existing equipment, and the advent of new power equipment that can be used in connection with rail renewals, have been remarkable and full advantage should be taken of such machinery to increase the quality and production of rail renewals. Those responsible for equipping rail gangs such as this should be constantly on the alert for new machines to simplify, speed up and improve the quality of rail-laying work. There are also special devices available and these too should be provided, if practical.

Adequate power equipment and spare units for every operation, where they can be used, should be provided. A list of power machinery that may be used by rail renewal forces follows: Rail laying crane, spike pullers, spike drivers, adzing machines, power wrenches, power rail drills, creosote sprays, power rail saws, cribbing machines, power grinders, tie boring machines, and air compressors.

In setting up a rail-renewal force it should be remembered that in most cases the rail-laying crane governs the maximum production possible of any rail-laying gang. While the production of other operations, such as adzing, spike pulling and spike driving, can be stepped up by increasing the number of men and machines, it is impossible to work more than one crane on one rail; but to utilize the full capacity of the present rail-laying crane would require more men and equipment than it is practical to operate in one rail laying force. Of course, the number of units of each type of power equipment will vary with the size of the gang and the head end, or those preceding the crane, must balance those following the crane to complete all operations at about the same rate of speed.

As previously mentioned, great progress has been made by manufacturers in power equipment and no doubt further improvement is possible, but by experimenting it is sometimes possible to find other uses for existing equipment other than those for which it is normally used. For instance, several railroads with highly-mechanized rail-renewal forces are now using a second crane to set out old rail, and other roads are seriously considering a second crane in their forces. It is apparent that the second crane is of immeasurable value through grade crossings, and switches to be relaid by the rail-renewal force, station grounds, and bridges, to handle the old rail and switch material, and set new rail where the rail-laying crane can reach them, thereby relieving the rail-laying crane of this work and speeding up production. Also, the old rail and switch materials are set up workwise for loading by the work train. The advantages thus gained by the second crane appear to be great and more than offset the cost of the additional crane in greater production and savings in labor.

There are many other special devices and new small tools in use on certain railroads that speed up production, remove the drudgery from hand operations and increase safety, such as tie-plate tongs or lifters, tie-plate pickers, to simplify removal of old plates, rail-joint clamps to assist in inserting bolts, rails swabs for lubricating rail ends, a bolt-grease dip and wiper and plastic goggles. Perhaps not all these are practical, but serious consideration should be given to tools and devices of this nature to improve methods and practices.

Suitable living facilities should be furnished and these are usually camp-car outfits consisting of converted box cars or passenger train equipment. The camp car equipment should be the best obtainable and the better they are equipped and maintained the more inducement there will be to attract and hold good men. Adequate sanitation facilities, together with suitable recreational space and light clean living quarters, should be provided as far as possible.

As outlined under "Organizing", the organization should be flexible to permit breaking up into two or more smaller units and this should be followed through in setting up camp-car equipment to provide for at least two self-sustaining units. This also permits the camp cars to be placed on different tracks when the force is working as a unit without disrupting the organization. Adequate box and flat cars should also be provided for storage and movement of rail-laying equipment between rail-laying jobs, and careful planning is necessary in setting up the equipment cars to reduce the loading and unloading time to a minimum. To facilitate repairs to machinery, a machine shop should be set up in a converted box car and included in the camp-car outfit.

The rail-renewal force should be equipped with heavy-duty motor cars, and truck and trailer cars to transport rail-laying equipment and personnel. Also, the truck cars are necessary in connection with the actual rail-laying to handle materials. Motor cars and trailers are usually favored over trucks to transport men because roads are not always accessible to the track. However, where conditions are favorable to trucks they should be used to transport men, and a combination of the two modes of transportation can often be employed to advantage. Of course, the same trucks can be used to transport equipment when practical, but most roads favor motor and truck cars for this purpose. A pickup truck for the mechanic is a must to handle repairs effectively.

A rail-renewal force with adequate transporting equipment, properly planned and well executed, can unload, move to the rail-laying project, break track and begin laying rail and likewise close up, move to the cars and load with all the efficiency and dispatch of an old-time circus outfit.

OPERATING

The order in which the lots of rail in the rail program are to be relaid must, of course, be set up. However, there are certan conditions, such as size of rail program, location of rail lots, climate and seasonal traffic, which obviously must be taken into consideration in setting up the renewal program. After the rail-renewal program has been set up to the best advantage, taking these conditions into consideration, it should be followed as closely as possible, and rail and materials unloaded in advance of the actual laying so as not to delay or disrupt the schedule.

Points at which camp cars are to be located require advance planning to reduce delays and travel time, and traffic conditions should be considered in this connection. Also, on long lots of rail the cars should be moved as the rail renewals progress, keeping them as close to the work as possible.

Operating a rail-renewal force of this nature does not present much of a problem in double or multiple-track territory where traffic is diverted and the force is permitted to work on dead track its whole tour of duty. It is a recognized fact that this is the most ideal condition under which to lay rail and every effort should be exerted to make this possible. It is often found practical and economical to install temporary crossovers in extremely long stretches of rail renewals to facilitate diverting movements. The other extreme is single track territory where traffic is so heavy that the track can be secured for only very short periods of time, and it is obvious that this type of force would not be practical under these conditions, and a small force with a minimum of power equipment should be employed. Then, there are light or moderate-traffic single-track territories, and in some cases relative heavy traffic where trains can be bunched or fleeted to provide longer periods of time when the track can be killed, and under these conditions a rail-renewal force of this nature can be used to advantage.

Help of Trainmaster Needed

Regardless of the above conditions under which rail renewals are made, the cooperation of the operating department is of the utmost importance in providing accurate information on train movements, bunching or fleeting trains, calling extra trains, if possible, so as not to interfere with the rail gang, etc.—In other words, giving the rail-renewal force full co-operation in securing maximum use of the track while the force is on duty. To make this possible, a trainmaster familiar with local conditions should be assigned to and work with the rail force.

If switches are not too close together, the rail-renewal force can lay them as it proceeds without slowing up the organization. However, if there are a large number close together, they should be laid by local or specialized forces either before or after the particular stretch of track is laid.

One of the most important details in operating a rail-renewal force of this type is the method of handling heavy equipment in clearing for trains, moving to and from equipment cars and moving between close lots of rail. It is the usual procedure on most railroads, when closing up for trains or at the end of the day, to set all the rail-laying machinery off to the side of the track, handling the heavy equipment with the rail-laying crane and clearing the crane in the nearest available switch or by setoff rails. When moving the equipment, it is loaded on truck cars and pulled by motor cars, the crane traveling under its own power. Of course, there are variations to this procedure on different railroads, but this is the general method followed.

One railroad with a highly-mechanized rail-renewal force has worked out a variation of this method and always clears the track by loading the equipment normally set off on truck cars and clearing in a spur or side track. Truck cars in the proper position for loading equipment, except spike pullers, which are moved on their own wheels, are included in the rail-laying procession, together with trailer cars for the men and are pulled by motor cars. The rail-laying crane sets the adzers on and off the truck cars and the small equipment is handled by hand methods.

By this method the entire organization, including all the equipment and personnel, is moved to and from the layup points, between close lots of rail and when clearing the track for trains. The only exception to this procedure is when clearing for trains and it is known the track cannot be broken again for some length of time. Then only enough laborers and operators accompany the equipment to handle the outfit while the balance of the force piles scrap or does other work. It is claimed this method reduces delays in breaking and closing the track, as the equipment is loaded and unloaded in work order and repetition in handling the equipment the same way each time further reduces the time required in breaking and closing the track.

From the foregoing remarks it may well be concluded that for rail renewals on large programs, under favorable conditions, that the ideal rail-renewal force is a

large system or regional type, organized, equipped and operated as set forth, and it is felt that this fact will become more apparent in the future as higher speed traffic and other conditions become more prevalent.

Discussion

R. L. Fox (Sou.) opened the discussion of the report by telling how the general practice of applying tie plates on his road differed from that mentioned in the report. He said that it had been found desirable to set double-shoulder tie plates under the rail after the rail had been placed on the ties. To assist in this operation a special device was used to "nip up" the rail so the plates could be set under it.

C. Halverson (G.N.) and others defended the method outlined in the report by telling of the excellent results obtained with tie-plate spacing tools.

P. E. Gullet (New York Central) asked if it was general practice on most roads to line out the old rail while it was still coupled together at the joints or whether the joint bars were removed first. The chairman replied that, under certain conditions, some roads found it advantageous to line out the old rail while still coupled. However, this was done no oftener than necessary because of the difficulty that method posed in finally disjointing the rail for loading. Most roads find it so much easier to untighten bolts with power wrenches and lift each rail out by crane.

By telling how his road had found it beneficial to heat the material with which rail ends are coated, A. H. Whisler (Penna.) started a general pro-and-con discussion of the merits of coating rail ends and "hanging" angle bars ahead of actual rail-laying operations. F. H. McKenney (C.B.&Q.) said that he preferred to apply the coating material by brush just before the bars were applied because this method assures that no foreign abrasive or corrosive material will get behind the bars before they become well seated. Those that use the "prior-coating" technique defended their method by disclaiming that the small amount of foreign material that might get behind the bars or on the coated rail does any harm.

Various Methods of Ballast Cleaning and Renewal

Report of Committee*

• Ballast cleaning has continued to be restricted to a point far below requirements, regardless of its importance to good track and the general knowledge that failure to keep the ballast clean results in increased maintenance expenditures or a decline in the standard of maintenance.

The two principal functions of ballast are: (1) To provide effective drainage, and (2) to distribute the load from the track to the roadbed. Both of these functions are seriously affected when the ballast is fouled.

The two greatest enemies of good ballast are water and dirt, which often combine to form mud, and attack the ballast from above and below. Wind-carried soils, spilled lading, cinders and sand from locomotives, combined with rainfall, attack the ballast from above, while water brought up from the lower roadbed section by capillary action, and mixed with dirt as it rises, attacks the ballast from below.

Even stone, which is recognized as the best ballast, loses much of its advantages when it becomes fouled. To retain its original effectiveness it must be kept clean, and this can be accomplished only by periodic removal of dirt. If we confine our remarks to cleaning of stone ballast it is because data is available for this type of ballast, while very little is known as yet

W. H. Haggerty
Chairman

of cleaning other ballast materials, except slag, which can be considered to be comparable with stone ballast.

Ballast should be cleaned when fouled enough to prevent proper drainage. It is obvious that no normal or average period can be established; not even for one road, because of the various conditions that effect ballast—weather, condition of subgrade, traffic, locomotive power and standard of maintenance.

Depth of cleaning depends on the amount of ballast under the ties. To do a perfect cleaning job all of the ballast should be cleaned. Since this is not a practical procedure, as much of the ballast as possible should be cleaned without damaging the stability of the track.

The shoulders should be cleaned to the level of the sub-grade. The intertrack spaces, however, should not be excavated quite so deep. A depth of 8 to 10 in. below the tie bottom is desirable. By keeping the floor of the intertrack space at a higher level than that of the shoulder, cross drains can be installed where required, with ample pitch to get the water away as quick as possible.

Crib ballast does not become fouled until after that in the shoulders and intertrack space is so dirty that drainage is blocked. When shoulder and intertrack spaces are cleaned it is desirable, but not always necessary, to clean the cribs. If the voids in the cribs are ample to permit the dirt to be washed out, it may be deferred, but if the cribs are not cleaned the intervals between cleaning the other spaces will usually be shortened.

Crib ballast should be excavated to a depth of slightly below the tie at the center line, sloping toward the tie ends where the excavation should reach a depth of 2 or 3 in. This will allow the dirt and slime, usually found under the ties, to leach out and to drain beyond the tie ends.

The practice of cleaning ballast originated shortly after crushed stone was introduced for ballast material. For many years hand cleaning methods were used, and there still are a few conditions under which this method is necessary.

Careful study should be given to locations where hand cleaning is necessary. Because of the present day high labor cost it is more economical in some cases to dig

*Chairman of this committee was W. H. Haggerty, general track supervisor, New York, New Haven & Hartford, New Haven, Conn.; vice-chairmen were W. W. Hay, assistant professor railway civil engineering University of Illinois, Urbana, Ill. and C. L. Heimbach, roadmaster, Atchison, Topeka & Santa Fe, Albuquerque, N. M.

out the ballast and dispose of it entirely without cleaning.

This association has had several reports presented in the past fifteen years describing the method of hand cleaning, using forks and screens. This method has not changed. The high cost and lower efficiency of hand labor, and the large amount of cleaning to be done, led to the production of mechanical ballast cleaners. The advance of this equipment in recent years has demonstrated that it will do a better job in less time, and more economically. Present-day labor could not accomplish enough work in hand-cleaning ballast to justify the prevailing wages. All problems have not been solved by these machines. However, we are greatly pleased with their performance, and recognize the important role they play in efficient and economical operation.

Many ballast cleaners are on-track machines, and therefore their work should be planned carefully and more intensive arrangements should be made with the operating department, to the end that the maximum use of the track will be secured, thereby eliminating costly delays through idle machine time.

Today the maintenance officer has available to him machines that will clean shoulder and intertrack ballast; excavate and clean crib ballast; clean ballast under the track; and remove waste ballast that is not economical to clean. He has available big-production or moderate-production machines to suit his budget and mileage requirements and on-track and off-track machines to meet the traffic conditions. He can lease some of this equipment if he desires, or can have the work done under contract.

One of the earliest of the ballast cleaners, is an off-track machine, self propelled for cleaning either the shoulder or the intertrack spaces. In operation this cleaner propells itself through the ballast by means of power-operated tooth wheels which ride and engage rack rails laid along and on top of the ends of the ties. These racks also serve to keep the machine in true line so that it clears passing trains. This machine digs its own way through the ballast, screening and returning the clean ballast to the space from which it was dug, and conveys the dirt beyond the track shoulder. It will dig to a maximum depth of 24 in. below top of tie and will complete from 700 to 1200 ft. per eight-hour day in the intertrack space and operates somewhat faster in the shoulder ballast.

A ballast-cleaning machine that has been in operation on many Class I Railroads in the country

J. P. Gannon, division engineer; A. C. Larson, general roadmaster; A. D. Alderson, maintenance engineer; C. P. Martini roadmaster—all M. St. P. & S. S. M.

continuously for the past several years is a big production on-track machine, mounted on a special car and pulled over the track by a locomotive furnished by the railroad. It is used exclusively by the owner company, with its own organization, to clean stone ballast for railroads on a contract basis. It is so designed that both the intertrack space and the shoulder can be cleaned simultaneously, or independently, as desired. It has on both sides scoops, belts, vibrating screens, ballast chutes, and scrapers.

The scoops, when in operating position, pick up ballast at a given uniform depth, placing it on a conveyor belt, which elevates and deposits it on a vibrating screen. The clean ballast falls into a hopper, from where it can be delivered to either the track or to either side. The dirt falls onto a conveyor, which can be swung to deposit it on either side of the right-of-way, or if this is not desirable it may be conveyed to one of several 40-ft. hopper cars in the train, on which are mounted specially-designed hopper-car loaders, to be disposed of at some other point.

The method of cleaning used by this machine calls for double screening; that is, two passes over each space. This allows wet and muddy ballast to dry before the second pass. This machine operates at a speed of from 80 to 200 ft. per min., according to the condition of the ballast. In operating position the machine does not foul adjacent tracks, if the track centers are not less than 12 ft. 10 in. The mechanism can be quickly operated to clear when it is desired to move over the road.

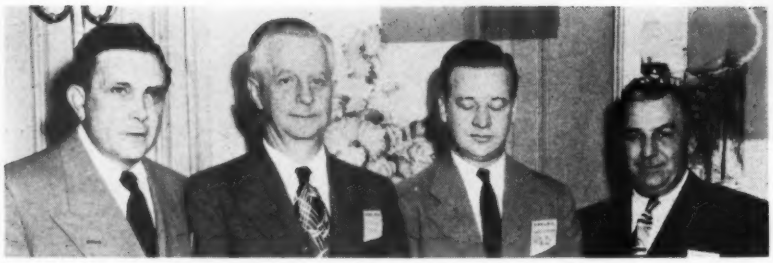
Another heavy-duty ballast-cleaning machine is said to be capable of cleaning a path 4 ft. wide on both sides of the track simultaneously at a speed of a mile an hour. In the early model all operations were powered by steam turbines, using steam furnished by a locomotive which also supplies the propelling power, when moving to and from the job and when working. Future design contemplates the use of electric drives throughout so the machine may be worked on all lines, whether steam is available or not, and with this design the machine will operate on multiple track.

The key parts of this cleaner are two cleaning boxes; one on each side. The remainder of the machine is simply a mechanism for supporting and manipulating the boxes. To operate the machine, the boxes are moved outwardly until they hang clear of the car. This is done by causing the booms, from which they are suspended, to pivot, and the boxes are lowered to the desired depth of cleaning. When in operation the boxes are fastened to the side of the car by overloading release devices, permitting disconnection in case of overloading or striking an immovable object.

The front of each box is equipped with in-gathering wings. The tie-side wing can be adjusted to gather all ballast up to the tie ends. Fastened to the bottom of the front of each box is a gouge that digs up the ballast. As each box is dragged along the foul ballast enters its front end, and is propelled backward and upward over a vibrating screen. Each screen is especially designed to remove the wet, sticky material often found in ballast.

The dirt and debris passing through the screen is first deposited on the sub-grade; it is then pushed to one side of the box by plows, and finally is picked up by a bucket conveyor at the back end of the box. The buckets elevate the dirt and discharge it to a chute, or to a transverse belt conveyor, which carries it to the side of the roadbed. The cleaned ballast is first deposited close to the tie ends, and is then shaped and distributed to any desired ballast contour by a special ballast shaper located at the rear of the box. Operation of the unit requires a chief operator, assistant chief operator, three operators, and two assistant operators.

In extensive tests during the past year, cleaning both sides of the



V. V. Holmberg, engineer maintenance of way; H. C. Koch, roadmaster; R. G. Michael, assistant engineer; H. J. Lieser, assistant roadmaster—all Belt Ry. of Chicago

track simultaneously to a depth of 8 in. below the ties, working speeds under favorable conditions reached 200 ft. per min. The maximum daily rate of cleaning both sides was a little over six miles in six hours of on track time.

A Three-Unit "Team"

In 1947, the first of a "team" of three machines was perfected for the removal or the reconditioning of ballast. This machine cleans out the cribs and deposits the material beyond the ends of the ties. An endless chain containing digging flights moves around a boom which enters the crib at the ends of the ties, moves downward to the desired depth and travels in under the rail to slightly beyond the center of the track. It will excavate as deep as 13 in. below the base of the rail if desired.

This machine will clean out 80 to 130 cribs per working hour, depending on the type, condition and depth of ballast being removed. It is manned by an operator and laborer. The laborer moves it from crib to crib while the operator controls the digging aparatus. This machine weighs slightly less than three tons and is equipped with a turntable and platform by which it can be moved from the track quickly. The practice of a number of railroads is to use 4 to 6 of these machines, all working on the same side of the track and in the same direction.

The second of the three-unit "team" mentioned above removes the shoulder or intertrack ballast, including that which may have been removed from the cribs. Buckets on an endless chain moving around a boom scoop up the material and deposit it on a conveyor. The boom is arranged so it can be raised, lowered, moved in toward or away from the track as desired, and waste material on the subgrade clear of a standard ballast section.

Forward motion is accomplished by a pulling chain 120 ft. long, actuated by a hydraulically-actuated winch. One end of the chain is fastened to a tie with a special clamp. This pulling chain is in two lengths joined by a snap connection, thus permitting uninterrupted forward motion. This machine is equipped with a slip clutch as a safeguard against injury when a buried obstacle is encountered. It is an on-track machine weighing 14,600 lb. and is manned by an operator and two laborers. It digs a uniform trench 42 in. wide to any desired depth up to 30 in. below the top of rail at the rate of between 800 to 1600 ft. per working hour, depending on the depth of the trench and quantity of ballast handled. A hydraulic turntable on the machine provides a quick method for turning so as to work the opposite side of the track and is also used with a set off platform for removing the machine from the track.

The third member of the "team" is a ballast cleaner close coupled to and towed by the ballast-removing unit. The cleaner receives the fouled ballast from the latter by means of conveyors. It is screened and returned to the track, the intertrack space or the shoulder, or a portion to either side as desired. A conveyor at the rear of the machine will deposit the dirt on either side up to a maximum of 26 ft. from the track centers. This cleaner is a wheel-mounted machine weighing 16,000 lb. and is manned by an operator and laborer. It can operate as fast as the machine feeding it. It can readily be removed laterally from the track by means of rams and transverse dolly wheels.

Cribber-Cleaner Combination

Another self-propelled on-track machine removes the ballast from an average of one crib every 45 sec. in cemented ballast and two per minute in the average fouled ballast. Pile-driver action of the diggers, obtaining force by the 27-in. drop of the 7200-lb. drophead, loosens ballast in the cribs and the digging bars force it out beyond the ends of the ties. At the same time six hinged mounted picks loosen the ballast in the crib ahead of that which is being cleaned. The machine cuts a uniform slopping profile from a point level with the base of the tie at the center of the track to 3½ in. below at the tie ends.

The ballast that is forced out from the cribs to the end of the ties is confined by a baffle screen to a location within the area of the cutting drums on the ballast cleaner. Thus when the cleaner comes along it picks up the material removed from the cribs as well as that in the shoulder and intertrack spaces. One or two cribbers, depending on the nature of the ballast, are necessary to keep pace with the follow-up cleaner. Two cribbers working three rail lengths apart move along as a pair, completing six rail lengths at a time. An operator and three laborers are used with each machine.

The ballast cleaner that is used with this cribber was put in actual operation in 1949. It also is a self-propelled on track machine. It can clean both sides of the track simultaneously or either side as desired, and does not foul adjacent tracks while operating.

This machine, weighing 16 tons, has recently been equipped with a method of propulsion that is entirely independent of the wheels. An auger on each side loosens the ballast and feeds it back to a cutter drum which, in turn, delivers the ballast to elevator buckets. The bucket elevators scoop up the ballast and carry it to a vibrating screen for cleaning. The drive mechanism is equipped with a slip clutch to prevent breakage when a hidden object is encountered. A pivoted belt conveyor disposes of the dirt beyond the track shoulder. The cleaned ballast is guided back to the track by troughs at the rear of the unit. The depth of the pick up can be regulated to suit requirements. This machine is designed to clean ballast at a rate of 800 ft. to 1000 ft. of track per hour. Both the cribber and the ballast cleaner travel at a maximum speed of 25 m.p.h. when running light and are outfitted to be quickly set off track, when necessary.

The disposal of dirt is an important factor to effective ballast cleaning. Dirt removed from the ballast and deposited along the track dries out quickly. If it is placed too close to the track the suction of each passing train draws the top layer back into the track from which it was removed. Dirt removed from ballast should not be deposited in cuts unless it is removed within a day or two because it will block drainage and

frequently is washed back into the shoulder. Where dirt from ballast is deposited on fills along main tracks it should be placed well down the bank.

Distributing Ballast

Old ballast should not be entirely removed from track unless new material to replace it is available. The open track is subject to buckling and requires slow orders; it should not be left skeletonized unless protected. The amount of ballast to be applied depends on the quantity in track after the cleaning operation, and how much is required for any follow-up work, such as raising, tamping and dressing.

The idea is to distribute the correct amount where needed. If this is closely followed considerable labor will be saved in rehandling, such as picking up excess material or dropping additional material whether it is done by hand or with a ballast distributor.

Conservation of material is another factor. Ballast must not be wasted by spilling over shoulders and down embankments, or be unloaded in excess of requirements. Where too much ballast is allowed to remain it will create excess labor in other maintenance operations.

Conclusions

Maintenance men have found that it is difficult and expensive to maintain track to the standards required today if the ballast is fouled. It is important that means and methods of cleaning and renewing ballast be considered very carefully so that maximum efficiency and economy be obtained. Each particular job, its size and location should be decided upon before work is started. Lack of a carefully-organized procedure will effect the quality and quantity of work, resulting in excessive cost.

Railroad management must realize the labor and material economies that are derived from clean ballast, the extent of which must be determined by each individual railroad based on local conditions and must recognize what has been accomplished by modern ballast cleaning equipment towards reducing the cost of maintaining clean ballast.

Discussion

In opening the discussion of this report, J. E. Fanning (I.C.) described the practice of his road in scarifying and disking ballast. He also extended an invitation to observe the operation of a large on-track ballast-cleaning machine new in service on his road. A. B. Chaney (M.P.) said that on his road ballast reconditioning is largely confined to the operation of ballast drainage cars, and asked if anyone could tell him about the results being obtained with the Matisa ballast cleaner. President Reese replied that, although he has not seen the machine in operation, he has inspected some finished work, which seemed very satisfactory. Mr. Reese also said that ballast cleaning on his road was started only two years ago and that the good results obtained so far indicate that the practice will be greatly expanded in the future.

Power Tamping Equipment and Its Effectiveness

Report of Committee*

• In presenting this report it is presumed that the subject "Power Tamping Equipment and Its Effectiveness" is to cover both the hand controlled and the larger mechanically-controlled machines. Therefore, the two will be discussed separately, as methods and organization of forces are somewhat different.

First and foremost, power tools should have proper maintenance and be kept in a serviceable condition at all times. This includes keeping the machines clean, replacing worn or broken parts, tightening bolts, etc., so as to assure readiness for service at all times. Too often, instances are found where machines and tools are brought out on a new job in the same condition as when they were set aside after finishing the last job. Correction of these conditions on the job results in a serious loss of efficiency, not only because of the reduced output of the machine, but also because of the effect this slipshod method of handling has on the morale of the maintenance of way

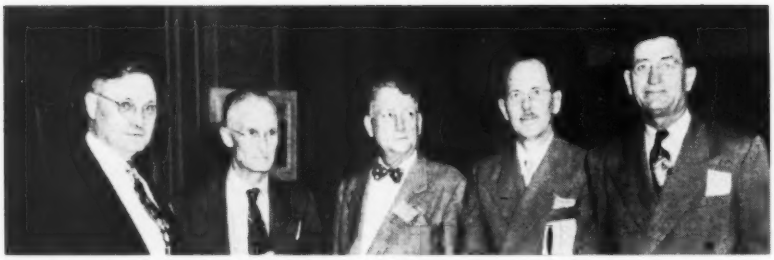
J. R. Kanan
Chairman

forces to which the machines are assigned.

With the equipment in proper working condition, the next thing in importance is the programming of the work so as to take advantage of every possible utility of the machines. Often an attempt is made to adapt machines to outmoded or old labor methods with the result that the machines are idle much of the time while other preparatory work is being done. Specifically, in tamping operations, sufficient care is not taken in the distribution of ballast, necessitating the transfer by hand of surpluses to lean locations. The raising of the track to proper surface or level is often neglected and dependence upon traffic to iron out irregularities invariably results in the necessity for smoothing operations that could have been avoided had the original raise or level been properly made. Hand-operated mechanical tie tampers do reduce the manual labor very materially, as much as 65 per cent, but more important is the fact that the power delivered by a machine is uniform, thereby making the efforts of each laborer about equal. This means that a longer-lasting job is produced at a substantial saving in cost, amounting to, at a most conservative estimate, half the hand labor that would otherwise be required. This estimate gives consideration to depreciation and upkeep of machines along with labor costs.

Machine-operated tampers, because the quality and quantity of the work is dependent upon one operator, produce a uniformity of work not possible with individually-operated tools. This uniformity assures a lasting surface and re-

*Chairman of this committee was J. R. Kanan, assistant engineer of track, Colorado & Southern, Denver, Colo.; vice-chairmen were J. E. Eisemann, roadmaster, Atchison, Topeka & Santa Fe, Prescott, Ariz., and W. H. Johnson, roadmaster, Seaboard Air Line, Wildwood, Fla.



R. J. Gammie, chief engineer, T. & P.; J. R. Rushmer, roadway engineer, A. T. & S. F.; J. Westcott, president, and treasurer, Du-Wel Steel Products Co.; C. H. Sandberg, assistant bridge engineer, A. T. & S. F.; E. L. Banion, general foreman, A. T. & S. F.

duces subsequent work or corrections to a minimum. These machines operated by one man can do more and much better work than 16 hand-operated machine tampers.

Power tamping has advanced very rapidly in the last three years because of the design of larger machines for use by larger gangs in general ballasting operations, and machines of various designs can be used in different operations. The effectiveness of such equipment is due to the uniform tamping work they do and this results in lower maintenance costs and a better overall surfacing job, which tends to lengthen the time between general surfacings. The value of power tamping depends, of course, on the size of the ballast used. On roads that use a larger type ballast a good job of hand tamping is almost impossible.

It is claimed that in the last 25 years railroads have reduced track labor 45 per cent and it is safe to assume that power tamping equipment should be in first place if this savings were broken down into various classes of work performed, particularly in the last few years since power tampers have received such recognition.

The committee has not attempted to derive any cost figures; reliable figures have not been established because of variation in conditions which are encountered on the various roads. These conditions include the type of ballast, condition of ties, number of ties per rail, amount of traffic, and the actual cost of maintenance on the machine itself. Also, of course, the height of the raise would have a direct bearing on the cost per foot, as some roads make a skeleton raise, spacing and inserting new ties and then follow up with a finished raise. Because of the removal of physical effort machines equipped with power tampers may be operated constantly and steadily, and, being controlled by a single operator, they result in a uniformity of work and speed of operation unattainable by individually-operated hand machines.

To obtain maximum production with power tampers it is mandatory that all preliminary work ahead be done well in advance of the machine. Some machines tamp a 39-ft. rail length every five minutes. Because of uniformity of the tamping the machines eliminate the usual picking up or spot tamping required back of surfacing gangs. This saving is a considerable sum and one difficult to reduce to figures, but is reflected over a considerable period of time for the reason that where spotting is done the original surfacing is disturbed. Consequently new spots occur, making necessary an almost constant operation between general surfacing programs.

The above, while not giving specific figures on savings, should reflect the possibility of greater savings where sincere and studied methods for getting the most out of the machinery are used. In this changing world machines and new methods are necessary to produce the economy the times demand.

The action of the power tamper is such that more uniformity, closer compactness and more even distribution of the ballast is made. This insures that the bearing surfaces of the ties are equal. Consequently, there is much less wear to the tie itself and, since the support is more uniform, the intervals between successive overhaulings of the track are greatly lengthened. There is also some damage to the ties caused by hand tamping, which enters into the problem of tie tamping.

Effect on Track Maintenance

The completeness and the thoroughness of any tamping job has a direct and very important bearing upon track maintenance in general. A well-maintained track must basically start with the ballast section. A ballast section not properly constructed and one which does not give complete support to the track is one that is not performing its function adequately. The prime requisite of ballast is to provide an even and adequate support in order that unequal track-destroying wear is not given to particular spots in track, such as joints, switches, and rail and road crossings. An unevenly-tamped roadbed will cause excessive wear to all other portions of a track section. While hand tamping has never proven completely satisfactory, primarily due to the fact that each man tamps differently and more or less inefficiently, it is considered that power tamping, when properly supervised, can create a track section that has a greater degree of regularity and consequently more adequate support. While the savings to be realized in this manner are not readily apparent, they must be considered in the overall picture.

As regards power tamping, the most important thing about which we must be assured is that the power tamping tool, no matter which type, will place the ballast beneath the tie in adequate quantities, and that, in so doing, the type of machine that does it and leaves the fewest voids, is the machine best fitted for the job. Of course, a certain type of machine will do as described with certain types of ballast, while it may be completely lacking in results with another type of ballast.

Due to the fact that railroads now have a 40-hr. week, the most economical method of handling track work must be used. Power tamping, as compared to shovel tamping, is probably one of the best means for saving and making maintenance of way money go further.

Use of Spot Tampers

Some roads have lengthened sections and reduced the number of laborers per section. This saving has been brought about by the use of hand power tampers, as one man with one of these units in spotting work will ordinarily accomplish as much as three men with ordinary hand tools, and the results obtained are more effective and lasting.

Tie renewals are facilitated by using tampers equipped with digging blades to loosen the ballast for removing the old ties. Tamping in the new tie with power tools insures uniformity and can be done in half the time required for hand work.

Other uses, such as loosening fouled ballast along shoulders to improve drainage, digging out farm crossings, chipping ice and cleaning flangeways with tampers equipped with digging blades, result in considerable savings over hand methods.

Organization is found to be the

key to economical operation, which starts with the transportation officers and ends with the track forces.

Discussion

By asking how high track should be raised to make effective use of power tampers, R. L. Fox (Sou.) started a lively discussion from many members, the consensus of whose replies indicated that the amount of raise was largely dependent on the condition of the ballast which in turn, influenced the type of rehabilitation work planned. Most members were in favor of light raises of four inches or less.

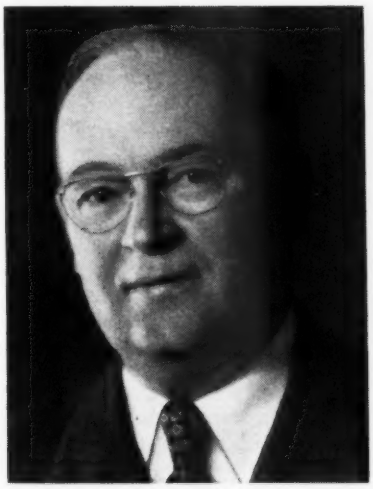
W. H. Bunge (M.P.) inquired if there was any advantage in using power tampers when installing crossties. The chairman and H. E. Kirby (C&O.) replied that savings of 20 to 50 per cent could be realized by using machines to tamp the track direct behind tie-renewal operations.

In reply to a question raised by J. S. Wearn (Sou.), J. C. Warren (Penna.) stated that he had, on occasion, used power tampers to tighten loose ties and in doing so, had obtained a good detail surface on the track.

O. H. Carpenter (U.P.) closed the discussion by telling the successive steps being used on his road to employ power tampers in raising track incidental to changing from gravel ballast to crushed rock of larger size.

Largest Exhibit Presented By Two Supply Associations

R. W. Torbert
President-Elect
Track Supply Association



R. R. Clegg
President-Elect
B. & B. Supply Men's Association

Having outgrown the exhibit hall at the Stevens hotel, the joint exhibit of the Track Supply Association and the Bridge and Building Supply Men's Association was held this year at Chicago's Coliseum, during the concurrent conventions of the Roadmasters' and Maintenance of Way Association and the American Railway Bridge and Building Association, Sept. 18-20. With 122 companies occupying 250 booths, the exhibit broke all records of these two associations. Several companies used more space than they had ever used before. Others, in addition to occupying more space, held demonstrations of their large machines operating on railways in the Chicago area. A complete list of the exhibitors, including the names of the representatives present and the products on display, was presented in the September issue.

The officers of the Track Supply Association who were responsible for the planning and conduct of the track portion of the record-breaking exhibit this year were: President, Kenneth Cavins, Fairmont Railway Motors, Inc., Chicago; first vice-president, R. W. Torbert, Oxweld Railroad Service Company, Chicago; second vice-president, W. A. Peck, The Rails Company, Chicago; and secretary-treasurer, Lewis Thomas, Q & C Company, Chicago. Directors of the association were: A. G. Reese, district maintenance engineer, C. B.&Q., Galesburg, Ill. (honorary); J. B. Templeton, president, Templeton, Kenly & Co., Chicago (ex-officio); W. A. Maxwell, American Brake Shoe Company, Ramapo Ajax division, Chicago; S. P. Murphy, Sperry Products, Inc., Chicago; A. J. Reading, Chipman Chemical Company, Inc., Chicago; W. B. Blix, Nordberg Manufacturing Company, Milwaukee; R. W. J. Harris, The Rail Joint Company, Inc., Chicago; and John A. Curtis, Pullman-Standard Car Manufacturing Company, Power Ballaster division, Chicago. Mr. Thomas served as director of exhibits.

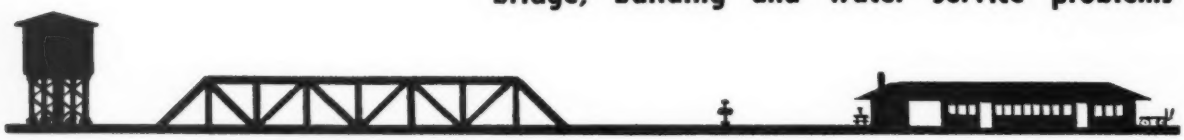
The officers of the Bridge and Building Supply Men's Association who planned their portion of the record exhibit were: President, G. R. Betts, Armco Drainage & Metal Products, Inc., Chicago; vice-president, R. R. Clegg, American Lumber & Treating Co., Chicago; treasurer, H. R. Deubel, Chicago Pneumatic Tool Company, Chicago; and secretary, E. C. Gunther, Duff-Norton Manufacturing Company, Chicago. Directors of the Association were: Howard Mull, Warren Tool Corporation, Chicago (honorary); Edward Wray, Railway Purchases & Stores, Chicago; Robert Mann, Modern Supply Company, Chicago; C. C. Rausch, Dearborn Chemical Company, Chicago; A. E. Bardwell, Fabreeka Products Company, Chicago; and L. R. Gurley, Modern Railroads, Chicago.

Each supply association held its biennial meeting on Tuesday, September 19. In the election of officers of the Track Supply Association, Mr. Torbert was advanced to president and Mr. Peck to first vice-president; Mr. Maxwell was transferred to second vice-president and Mr. Thomas was re-elected secretary-treasurer. New directors elected for a term of two years were: N. A. Howell, Hubbard & Company, Chicago; David R. Watson, Modern Railroads, Chicago. Mr. Cavins became a director ex-officio.

In the election of officers in the Bridge and Building Supply Men's Association, Mr. Clegg became president; Mr Deubel was elected vice-president; Mr. Gurley was elected secretary; Mr. Bardwell was elected treasurer; and Mr. Betts became an honorary director. New directors elected were: E. C. Gunther, Duff-Norton Manufacturing Company, Chicago; Harry Fowler, American Structural Products Company, Toledo, Ohio; and Harry Wolfe, The Lehon Company, Milwaukee, Wis..

WHAT'S THE ANSWER?

An open forum for maintenance men on track, bridge, building and water service problems



Unloading Frogs from Gondolas

When a crane is not available, what is the best method of unloading a frog from a gondola car? Explain.

Jack Up One End at a Time

By H. S. CHANDLER
General Supervisor Track, Chesapeake & Ohio, Richmond, Va.

I think the safest method of unloading a frog from a gondola car would be to use two track jacks and twelve or more crossties, the actual number depending on the height of the car. By jacking one end of the frog at a time, and forming a pen with the crossties to support the frog and jacks, you can raise the frog 7 in. at a time until it is above the side of the car. When the frog has been jacked to this point it can then be skidded off to the ground. Caution must be taken in building the pen so that the ties will not "kick-up" when the frog is moved over to the side of the car.

Raise on Crib, Drop on End

By CHARLES MILLER
Assistant Roadmaster, Western Pacific, Elko, Nev.

If I ever received a frog in a gondola-type car, I would first bring all of my herbs, owls' tongues, etc., down from the attic, boil up a witches brew and place a curse on the man who shipped me the frog in that type of car. Thus pacified I would proceed with the unloading.

It is assumed that the frog is the only piece of material in the "offending" car, that the car is not the drop-end type, that it is spotted near the place the frog is to be stored or used and that this location is free of obstacles and wide enough to allow the frog to drop without damaging some object on the ground. If such is not the case, additional care must be exercised to prevent injury to the workmen, the frog or the objects which it may strike—or the car moved to such a place.

The first problem is to raise the frog to the level of the car's top. This may be accomplished with the aid of two No. 2 track jacks and some crossties. By using one jack at each end and working them alternately, the frog can be lifted, slowly and safely, the thickness of a tie and a crosstie crib built under it. By repeating this operation as often as necessary, the frog can be lifted until it is as high as desired. When the frog has been raised high enough to clear the sides of the car, it is swung around perpendicular to the car centerline and then adjusted until an end rests on each side of the car. If the bottom side of the frog has riveted plates, the frog should be turned with that side up to insure a free slide as it is moved outward until it topples down. This is important, since anything that may "catch" and thereby cause an unexpected or irregular motion, is a potential accident. With the frog now leaning against the car with one end on the ground, we need only to pinch the car ahead and allow the complete frog to drop to the ground. During this somewhat dangerous operation, no one is to be permitted at anytime along the side of the car or even near it.

Answers to the following questions are solicited from readers. They should be addressed to the What's the Answer editor, *Railway Engineering and Maintenance*, 79 W. Monroe St., Chicago 3, and reach him at least 30 days in advance of the issue in which they are to appear. An honorarium will be given for each published answer on the basis of its substance and length. Answers will appear with or without the name and title of the author, as may be requested. The editor will also welcome any questions which you may wish to have discussed.

To Be Answered In the December Issue

1. What is the maximum, minimum, and ideal amounts that track should be raised to permit its being effectively and economically tamped with on-track tampers? What factors govern the height of raise? Explain.

2. What are water-repellant wood preservatives? Under what circumstances is their use indicated in railway buildings? What are their advantages for such use? Explain.

3. In renewing rail on new, double-shoulder tie plates, should the plates be applied before or after the rail is set in place? What are the relative advantages and disadvantages of each method? Explain.

4. To what extent is it desirable to use bolts in place of rivets in steel bridges? Why? Is the use of bolts and rivets in combination indicated in some cases? If so, where? Explain.

5. What types of off-track work equipment are effective in opening snow-filled cuts? What procedures in using such equipment for this purpose give the best results?

6. To what extent is the water service department involved in the design, operation and maintenance of car and locomotive washing facilities?

7. What are the advantages and disadvantages of tearing down retired buildings with company forces rather than under contract? When railroads do their own work, what use is made of the salvaged materials? Explain.

Whether or not a spring frog might be damaged by such rough handling is a matter of opinion and should be decided by the local officers. If they think that such treatment is unwise, the following method can be used.

Two rails of equal length—at least 20-ft.—can be used as skids. They should be placed with one end on the ground and the other resting on the top of the car's side, spaced to come inside of the outermost riveted plates on the frog. That taken care of the frog should be raised high enough to clear the skid rails and placed bottom side down, parallel with the centerline of the car. From this position it can be slid slowly down the skid rails to the ground with the riveted plates acting as guides to keep the frog in line and to prevent a side-slipping movement which might allow it to get out of control and injure someone. As additional protection against side slipping, a spike may also be slipped into one of the punched spike holes in the tie plates.

In this manner a spring frog can be lowered to the ground without damaging any of its flexible parts, but it places the men in a disadvantageous position as well as presenting the additional problem of placing the skid rails. For these reasons I believe that I would unload both rigid and spring frogs in the manner first described and then submit either type to a minute inspection before installation.

Controlling Corrosion in Trainsheds

How does the corrosion of steel members affect the maintenance of trainsheds? Explain. What methods of controlling such corrosion are effective?

Matter of Design and Care

By J. B. Schaub

Assistant Engineer of Buildings, Illinois Central, Chicago

Trainsheds of steel construction are usually subject to more concentrated corrosion than other types of railroad structures, except possibly enginehouses. The steel members exposed to the direct contact of locomotive exhaust and stack gases should have a concrete protective encasement or they will require special maintenance. In some locations, the corrosion condition has been greatly reduced by the replacement of coal-burning locomotives with Diesel locomotives.

In the early days of railroad development, trainsheds were bulit of sufficient proportions to permit access of the entire train. The locomotive exhaust and fire-box gases were expected to rise to the high-arched roof and dissipate to the atmosphere through monitor windows or louvers. This did not always happen, especially when the atmosphere was heavy and damp. In any event, there was always a tendency for corrosive sedimentation on the structural members. In more recent years, trainsheds have been designed with better provision for discharging the exhausts and gases to the outside air and thereby eliminate the contact with the structural members.

The writer's experience with two sheds of the high-roof type, erected about 1892, showed that the corrosive effects of the gases required the replacement of steel members beginning about 26 years later. Replacements occurred at fairly regular intervals until the sheds reached the point where it was not economical to maintain them after about a 50-year life. They were then converted to the low-type shed with smoke slots immediately above the locomotive stack to carry off the locomotive exhaust gases to the atmosphere.

In these sheds all steel which would be exposed to the direct blast of the smoke and gases was encased in concrete and no special maintenance problem has developed since that time.

In all cases, the smoke slots should be of high-grade concrete, asbestos board, or possibly cast-iron, to resist the corrosive action. All steel members should be protected with high-grade metal paint. Periodic inspections should be made at sufficiently frequent intervals to determine the necessity for repainting before protective coatings fails and corrosion starts. The critical points are where pockets of gas or dust and cinders accumulate.

To summarize, steel members in trainsheds are subject to more than average corrosion and therefore present a special maintenance problem. These problems should be recognized when the shed is designed and the exposure conditions minimized. During the life of the shed, the exposed steel members should be kept protected with a good steel-protective coating of paint or concrete encasement.

Design for Easy Painting

By F. W. Biltz

Assistant Chief Engineer, Reading, Philadelphia, Pa.

Correcting the effects of corrosion is the most costly item of expense in connection with the maintenance of a steel trainshed. This corrosion can result from both sulphurous fumes of steam power and a leaky roof covering. Corrective methods for the latter cause are, of course, obvious. To arrest the effect of the fumes, frequent inspection and painting are requisites.

It is known that deterioration is accelerated where engine gases are trapped in pockets and particularly where wood is in contact with the steel. Relief is sometimes obtainable in old structures by structural changes such as introduction of louvres for ventilation.

In the design of new structures experience has taught that proper ventilation is of first importance, paying attention to the elimination of pockets in which gases can be trapped to attack the steel. Secondly, consideration given to the accessibility of all members for ready inspection and ease of painting, will pay dividends.

Paint Sufficiently Often

By H. Austill

Chief Engineer, Terminal Railroad Association of St. Louis, St. Louis, Mo.

Corrosion of steel members in a trainshed has the same effect fundamentally as corrosion of steel members of any structure, i.e., it results in a loss of section of steel due to the oxidation of the surface. I presume what is really meant is whether there is a material differ-

ence in the rate of corrosion of steel members in a trainshed as compared to other steel structures.

Of course, when coal-burning locomotives stand under a trainshed and emit large volumes of smoke containing a form of sulphur the rate of corrosion of unprotected steel is quite rapid, particularly, where the ventilation is not good. This condition does not occur where only Diesel and electric locomotives are used.

Where there is no smoke the rate of corrosion should be no different from that in any other structure and where there is smoke, the corrosion of the steel members can be reduced very much by good ventilation. Since the question pertains to corrosion and not to damage from locomotive blast the best method of protection is simply painting the steel sufficiently often with suitable paints.

Using Standard Safety Color Code

What is the standard safety color code? Can it be adapted to railway use? Explain.

Six Colors Identify Hazards

By S. W. Quisenberry and Harry E. Matter

Finishes Division, E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

The Safety Color Code is a uniform system of color signals which is used by railroads and all types of industry. This Color Code was developed by safety and color experts of the Du Pont Company and Faber Birron, color consultant of New York. It was first announced at the Fifteenth Annual Safety Convention of the Greater New York Safety Council, on March 28, 1944.

Six colors are used in this general industrial Safety Color Code:

(1) Yellow – to mark strike-against, stumbling, falling, or tripping hazards.

(2) Orange—to mark portions of machines or equipment that might cut, crush, electrocute, or otherwise injure a worker.

(3) Green – to mark first-aid equipment.

(4) Red—to mark location of instruments for combatting fire.

(5) Blue—to mark electrical controls and equipment under repair, and which therefore should not be operated.

(6) White (or gray or black)—to mark aisles, storage spaces, waste receptacles, etc.

In the development of the Safety Color Code, Faber Birron and the DuPont men working with him took into consideration the associations which peoples of all parts of the world have given to color through the ages. Then they weeded out colors until they had been reduced to six. These six were chosen because of their practical aspects and traditional associations. The end-use involved was the determining factor in all cases.

Yellow was picked to indicate the strike-against and other hazards of that type because it has a very high visibility under practically all lighting conditions. Yellow has the most powerful attraction to the eye of all colors. Most color-blind people can distinguish yellow even when they are confused by red and green.

Orange, like yellow, has a high attraction to the eye. It possesses good visibility, even in shadow. This is in contrast to red, which is apt to appear brown in shadow. Therefore orange is ideal for marking danger areas. Green was chosen for safety equipment because of its traditional association with this subject.

Red's association with fire protection has long been established. Everybody who has seen a fire company in action links red with fire. The authors of the Safety Color code chose it for this one purpose.

Blue was chosen as a color to issue a note of precaution because it has been used for many years to indicate caution. An effective way to use it is to place a blue disk on equipment which should not be operated.

White, gray, and black—colors which are not as striking as the other five used in the code—are reserved for the lesser roles of indicating traffic lanes, corners, rubbish boxes, and the like.

In the few years that have transpired since its introduction, the Safety Color Code has been widely adopted by railroads and industries in many fields. It is difficult to compute its value statistically—but it has been credited with its share, along with other safety measures, in reducing lost-time injuries. These reductions not only contribute toward improved morale of employees, but effect savings to industry by reducing payments for compensation and medical service.

Laminated Members for Pile Caps

To what extent is it practicable to use laminated members for caps in pile trestles? Can other bridge members be laminated? What are the advantages and disadvantages of such practice?

Laminated Members in Use

By J. P. Dunnagan

Engineer of Bridges, Southern Pacific, San Francisco, Cal.

We have laminated members* in one structure consisting of two 15-ft. panels, or a total length of 30 ft. This bridge is located in the desert in the vicinity of the Salton Sea, Southern California, at an elevation of 200 ft. below sea level. This location is subject to intensely high temperatures during summer months but a mild climate during the winter. Both the stringers and caps in this structure are laminated. The stringers are creosoted Douglas fir 30 ft. long, 8 ft. wide and 18 in. deep. The caps are 14-in by 14-in. creosoted members. The structure was installed in 1946 and to date has given complete satisfaction.

After lamination, these members were included in either of two charges, each given a full-cell treatment with straight creosote, consisting of 12 hr. boiling under vacuum at 190 deg. F., 125 psi. pressure at 180 deg. F., and 1 hr. final vacuum. The pressure period for one charge was 9 hr. 5 min., that

* An illustrated article describing these members in detail appeared on page 579 of the June, 1947, issue of **Railway Engineering and Maintenance.**

for the other was 15 hr. The gross injection and net retention are not known for these pieces as they were both included in charges made up of large and small material. However, in general, we inject 12 lb. per cu. ft. in material over 4 in. thick, but no pressure period is held over 15 hr. and large timbers seldom take over 10 to 10½ lb. per cu. ft. in that period.

After passing through the treating retorts, there was very little evidence of glue-line failures. We give this installation frequent inspection and the timbers look as good now as when they were installed in 1946.

Advantages Warrant Trial

By A. E. Bechtelheimer

Bridge Engineer (Retired), Chicago & North Western, Chicago

Addressing the American Railway Bridge and Building Association convention in 1948, George M. Hunt, Director of the Forest Products Laboratory at Madison, Wis., said in part: "Currently the most significant fact about wood and its uses in railway structures is its high cost, and the high cost of the labor to build it into useful structures." He stressed the importance of avoiding wood waste and of reducing labor costs in building and maintaining wood structures by procedures that will insure longer life of the wood used. He also advised giving more study to annual costs since spending more money on first cost often will result in lower annual costs and fewer repairs.

The practicability of using laminated caps in pile trestles is primarily dependent upon the relative cost and the life expectancy of each type. Doubtless, the first cost of the green timber for the solid members is considerably more than the cost of the many small-sized pieces required for laminated members.

Caps, as well as stringers, for use in pile trestles can be fabricated by the laminating process which consists of gluing together relatively thin and narrow pieces of lumber to form a member of the desired cross section and length. In contrast to the solid caps over which producer and user have minimum control, the laminated caps appear to offer producer and user maximum control They can be built up in piles from ¾ in. to 3 in. thick and from random widths of 4 in. and more. The lumber to be used can be specially selected for its specific use, although the grade used should meet the stress requirements of the design.

The cost of laminated caps is high because of the mill work required in preparing the pieces for gluing. The surfaces must be smooth and true. Machine marks, chipped or loosened grain and other surface irregularities must be avoided. The variations in thickness must be held to very small tolerances. Great care must be exercised in fitting longitudinal scarfed and butted joints. The lumber must be thoroughly seasoned. A moisture content of 10 to 12 per cent at the time of gluing is preferable. These and other requirements constitute only a general outline of the precise care and workmanship required in fabrication of laminated caps, but suffice to show why the first cost may be high.

Complete specifications covering the laminating process and consideration of all the details and facilities involved in their manufacture, are so formidable that one may hesitate to consider its use. Yet the advantages embodied in built-up caps, such as selected lumber throughout, positioned to conform to stress requirements and working conditions, and treated for long service life, in contrast to solid timbers, many of which show visible defects and may contain hidden defects that impair their strength and usefulness, warrant painstaking research to determine the feasibility of their use.

Service Assignment for X-Rayls

What are X-Rayls? Why must their service be limited to specific locations? For what classes of service are they suitable? Explain.

X-Rayls Potentially Unsound

By Track Supervisor

To understand the practical meaning of the term "X-Rayl", one must first have at least a casual knowledge of rail manufacture, and some of the inspections by which rails are classified.

When rail steel in an open-hearth furnace reaches the right temperature and has the correct chemical analysis, it is teemed (poured) into molds to form a total of 20 to 30 ingots. The lengths of these ingots not only vary slightly with the section of rail to be rolled, but since specifications require that drop-test pieces be taken from the second, middle and last full ingot of each heat, those particular ingots are given extra length.

Shortly after the ingots have solidified, they are delivered to "soaking" pits where they are gradually heated to the correct rolling temperature. During this process they are handled in a definite order so that the identity of heat and ingot numbers can be maintained.

Each "soaked" ingot is then rolled, top end first, into a long "bloom" about eight inches square. The rough ends of each bloom are sheared off and discarded and the remainder divided transversely into two and sometimes three shorter blooms for further rolling. Each of these smaller blooms is then passed in order through forming and finishing rolls until converted into a "rail bar" from which two to four rails can be sawed, of which the first rail of each ingot will be lettered "A", the second "B", and so on.

The front end of the first rail bar emerging from the finishing rolls represents the top of its ingot and therefore the rail that is most likely to contain impurities which did not float to the top of the ingot and become thrown away with the discard.

Here, then, is the logical rail of each ingot to test for internal defects. Hence, when the top end of the No. 1 rail bar of each ingot is cropped for discard, a few feet are included for test purposes. Provided the rails of the heat have passed the "drop test", this cropped end is "nicked and broken" about six inches from the bottom. If the fractured surface of this test specimen exhibits "seams, laminations, cavities, interposed foreign matter, or a distinctly bright or fine grained structure", the top or "A" rail is **tentatively classified** as an X-Rayl, subject to final examina-

tion of its top sawed end. If visual examination of that end of the "A" rail—after it is taken out of the control-cooling containers—shows no piping, segregation or any other defects, the rail is **definitely** classified as an "X-Rayl", the ends are painted brown and an "X" is stamped on "both end faces". However, if the end has any visible defects, it is "broken back" in progressive increments until the fracture is free of such defects and the remainder of the rail—if more than the minimum acceptable length—is classified as a No. 1 —"A" rail.

The only rails finally classified as X-Rayls are such rails whose representative "nick - and - break" test specimen contained an interior defect which was not disclosed by visual examination in the top end of the "A" rail. From this it can be seen that an adequate force of experienced rail inspectors is necessary to insure getting rail of the highest quality that strictly meets the requirements of A.RE.A. specifications.

When X-Rayls are thus explained, the reasons for limiting their service assignments are readily apparent. Since such rails, at their best, are the most potentially defective of the "A" rails, it behooves maintenance men to restrict their service at least to tangent track, preferably where speeds are slow and the hazards from a possible derailment are least.

On most of those roads that accept X-Rayls, instructions for their use are specific. One such instruction states, "X-Rayls shall be used, insofar as possible in turnouts. They shall not be used in main tracks when train speeds exceed 25 m.p.h. . . . or in main track on curves, in tunnels, or on bridges."

Instructions on another road prohibit the use of X-Rayls: (1) At locations where passenger trains are scheduled or operated frequently in detour service; (2) where trains run regularly faster than 35 m.p..h.; (3) in tunnels; (4) on most bridges; and (5) on elevated tracks adjacent to retaining walls.

Ion-Exchange Water Treatment

In ion-exchange water treatments, what is the distinction between cation exchangers and anion exchangers? Explain. How do regeneration methods differ for each?

Ion Exchangers Help Diesels

By E. L. E. ZAHM

Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

The complete deionization method of water purification usually involves the passage of the water to be treated through at least two separate beds of exchange material. The water (under pressure) passes first through the cation exchanger bed and then through the anion exchanger bed. It is then run through a decarbonator and the effluent is equal in quality to unsterilized distilled water.

Ions are described as extremely minute particles which carry either a positive or a negative electrical charge and which are present in a water solution of acids, bases or salts. If the ion carries a positive charge, it is called a cation and if it carries a negative charge, it is known as an anion. In the purification of water the influent is first passed through the cation bed of exchange material which has the ability to absorb the metallic ions (positively charged) and convert the metal salts to acids. This water is then passed through another bed of exchange material (anion exchanger) which causes the hydrogen ions from the acid groups of the cation exchanger to produce water molecules. No positively or negatively charged ions remain.

During the exchange operation the beds gradually adsorb ions and finally reach an exhaustion point and then must be rejuvenated or regenerated. This is accomplished by backwashing the units containing the exchange beds and by treating them with solutions containing the ions that were displaced during the operation. A solution of sulfuric or hydrochloric acid is used to regenerate the cation exchanger while a solution of sodium carbonate is generally used to replace the adsorbed ions in the anion bed. The units are then rinsed and are ready for another cycle of water purification.

Various modifications of this ion exchange process are used and the system is not only applied to water purification but also to other industrial processes. The rapid development of this method of water conditioning during the past few years has been of considerable value to the railroad industry as the widespread application of Diesel locomotives has necessitated refinements in water-treatment methods to provide suitable water for steam generators and Diesel cooling systems.

New Exchangers Effective

By WILLIAM W. AULTMAN

Water Purification Engineer, Metropolitan Water District of Southern California, LaVerne, Cal.

Before an answer can be given to this question the terms must be defined. Webster defines an ion as; "One of the electrified particles into which . . . the molecules of electrolytes are divided by water and other substances. Those which are positively electrified (hydrogen and the metals) are called cations; negative ions (hydroxyl and acidic atoms or groups) are called anions." The common soluble constituents of water are therefore classified as:

Cations		
Calcium	(Ca)	++
Magnesium	(Mg)	++
Sodium	(Na)	+
Potassium	(K)	+
Iron	(Fe)	++
Hydrogen	(H)	+
Anions		
Chloride	(Cl)	−
Sulfate	(SO_4)	−−
Carbonate	(CO_3)	−−
Bicarbonate	(HCO_3)	−
Hydroxide	(OH)	−
Nitrate	(NO_3)	−
Silicate	(SiO_3)	−−

Ion exchange is technically defined as a reversible interchange of ions between a liquid phase and a solid body with no radical change in the solid structure. An ion exchanger, or solid body, must have ions of its own to exchange for others and a highly porous structure or large exposed surface to allow those ions to move in and out. Thus a cation exchanger ready for use will have sodium (Na) or hydrogen (H) ions and an anion exchanger will have hydroxyl (OH) or carbonate (CO_3) ions of its own. Ion exchangers generally look like sand or very fine shot and may have different colors, depending

upon the type of exchanger being used.

The natural (greensands) and synthetic zeolite have been used for years as cation exchangers operating on the sodium cycle. More recently—since about 1940—organic exchangers of the resinous type have been developed for cation exchange on the hydrogen cycle and for anion exchange. By using a combination of these two last types of exchangers, water can be almost completely demineralized.

Cation exchangers used in water treatment are generally regenerated with either sodium chloride or acid (hydrochloric or sulfuric). Where only water softening is required, the sodium cycle may be used whereby the hardness-forming calcium and magnesium are removed from the water and are replaced by non-hardness forming sodium derived from the cation exchanger.

If demineralization is desired, the water is first passed through a hydrogen exchanger wherein all cations in the water (Ca, Mg, Na, K, and Fe) are replaced with hydrogen (H). The water thus produced is weakly acidic, containing HCl, H_2SO_4, H_2CO_3, etc.

This weakly acid water is then passed through an anion exchanger wherein the anions (Cl, SO_4, NO_3, etc.) are replaced by either the hydroxyl ion (OH) or the carbonate ion (CO_3), depending upon whether caustic soda (NaOH), ammonia (NH_4OH), or soda ash (Na_2CO_3) is used as a regenerant of the exchanger. Silicic acid (H_2SiO_3) is such a very weak acid that it is not absorbed by the usual anion exchangers in the conventional demineralizing process. The water thus produced will therefore contain only hydrogen (H) ions and hydroxyl (OH) or carbonate (CO_3) ions plus any silica (SiO_2) originally in the water. Therefore it is either H_2O—water, or H_2CO_3—carbonic acid. By aeration or other means, the carbon dioxide (CO_2) may be driven out of the carbonic acid (H_2CO_3), leaving H_2O—water containing some silica. Recently a highly-basic resinous anion exchanger has been developed that will remove silica so a demineralized water can, if necessary, be produced by cation and anion exchangers equal or superior in quality to distilled water.

This is not quite as simple as it appears, for there is generally some leakage of ions through the exchangers, so that when complete ion removal is required instead of a single cation unit and a single anion unit, it is necessary to pass the water being treated through a series of such units. In most rail road work such purity is not required and single unit demineralization equipment may often be satisfactory.

The regeneration procedure is the same for both cation and anion exchangers, except for using a different regenerant. The exchanger unit is first backwashed to expand and regrade the bed and remove any suspended matter which may have accumulated on the top of the bed exchanger. Then a solution of the regenerant of optimum concentration is passed slowly downward through the exchanger bed and is followed by rinse water in sufficient quantity to remove the regenerant from the bed. The regenerant for the cation exchanger is sodium chloride (NaCl), if operating on the sodium cycle, or hydrochloric or sulfuric acid (HCl or H_2SO_4 if operating on the hydrogen cycle. Filtered sea water or other salt brines, if of proper quality, may also be used for regenerating sodium cation exchangers. For the anion exchangers either caustic soda, ammonia, or soda ash may be used.

Since the cost of demineralization is directly proportional to the salinity of the water being treated, the better the quality of the natural water being used the lower the cost of demineralization.

Designing Machinery-Repair Trucks

What type of body is most suitable for work-equipment repair trucks? What tools and equipment should be provided*

Telephone-Type Economical

By V. W. Oswalt
Assistant Superintendent, Scales & Work Equipment, Southern, Washington, D. C.

After several years of trial and error, the truck body known as the telephone-type, mounted on a one-ton truck chassis, has proven extremely satisfactory, both as an investment and for practical use. A repairman having this type of truck has ample storage room for small parts, bolts, nuts, as well as space for units such as carburetors, magnetos, spark plugs, piston assemblies, connecting rods, etc. He has a clothes locker with room for a traveling bag and compartments for tools suited to his work. All compartments are weatherproof and provided with locks.

Between the compartments there is floor space for hauling small portable machines, such as generating plants, rail saws, rail drills, bolt tightening machines, etc. This space is usually about 4 ft. by 7 ft. and is either open or has a closed top, whichever is desired. A ¾-ton truck can be handled over the road similar to a passenger car, it is sturdy, will safely handle a load up to one-ton or more, is economical to operate, and rides comfortably. This means less fatigue for the mechanic after a long service call. The truck should be equipped with a heater and defroster in most climates. Above all it should be maintained as an outstanding example to machine operators of the results of care and good maintenance.

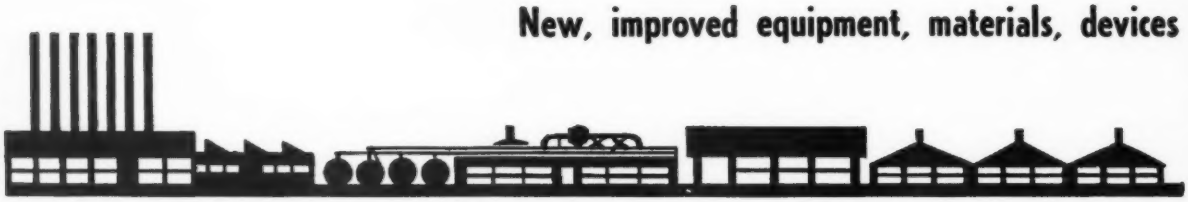
A traveling roadway mechanic should be equipped with good hand tools to meet all the requirements of his job—maintenance of machines. Such tools should include a complete set of 12-point socket wrenches ranging from 3/16 in. to 1¼ in., valve wrenches, magneto wrenches, box-end wrenches (3/16 in. to 1 in.), screw drivers, pliers, chisel-and-punch sets, stencil dies, soft hammers, ball-peen hammers, various pinch bars, special wrenches and pullers, a portable generator of 1250 watts to 1800 watts, ¼-in. to ¾ in. drill motors, reamer and drill sets, "easy-outs," a 50-ft. drop cord, flashlights, a 5-ton hydraulic jack, and some special tools recommended by machinery manufacturers.

A truck of this size adequately equipped boosts the morale of the roadway mechanic, making him a more efficient workman, and its worth is reflected in the availability and condition of the work equipment under his care.

* Another answer to this question was submitted by W. E. Kropp, Supervisor M/W Work Equipment, Lehigh Valley. Because of its comprehensiveness it has been withheld for publication as a feature article at a later date.

PRODUCTS OF MANUFACTURERS

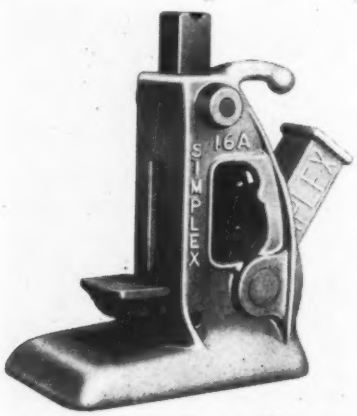
New, improved equipment, materials, devices



(For additional information on any of the products described in these columns, use postcards, page 903.)

NEW TRACK JACK

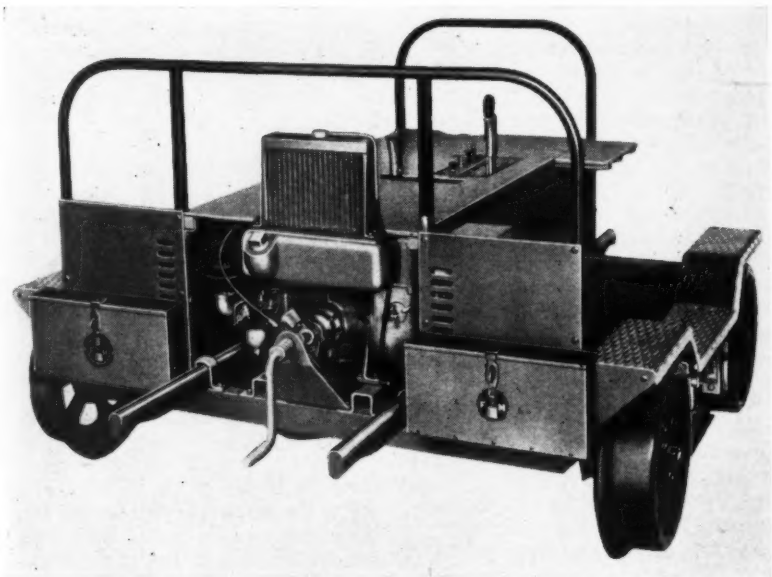
A NEW Simplex, single-acting track jack, designated as model No. 16A has been announced by Templeton, Kenly & Co., Chicago. This jack is basically similar to its predecessor, the No.-15A, Universal track jack but is said to have important improved features. The new jack retains the square forged toe, measuring 2½ in. by 3¼ in., of the old jack but the minimum height of that toe has been reduced to 1½ in. This is said to permit the placing of the



The Simplex Model 16A track jack

jack under a rail without removing ballast, and to require considerably less digging when the jacks are placed under the ends of ties. The jack has also been redesigned so that it can now be tripped from either the right or left side, with the operator protected in each case by an improved type of safety thumb guard.

The new track jack has a height of 12 in., a lift of 6 in., a minimum toe lift of 1½ in., weighs 45 lb., and has a capacity of 15 tons.



The Fairbanks-Morse Model 101 motor car for inspection service

INSPECTION CAR

FAIRANKS, Morse & Co., Chicago has introduced an inspection motor car with a friction wheel transmission drive which is said to permit immediate reversal in the direction of travel of the car without the need of reversing the engine. The new car has been designated as the Model 101.

Other features of the car include a resilient friction wheel filler which cushions the driving and driven members of the car against engine impulses and thus provides easier riding; self-alining ball bearings; and wheel silencers which dim the ringing of the wheels on the rails. The car has four speeds forward and three in reverse and is designed to accomodate four men. Its rear lifting weight is 98 lb.

ALL-METAL SCAFFOLDING

THE Amidon Sales Company, Elyria, Ohio, has announced a new system of all-metal scaffolding which can readily be built to any length, depth, height or shape required, and which can be erected on hillsides, stairways, or rough terrain as readily as on level ground without using screw jacks or special footings. Moreover, if rolling scaffolds are desired, standard castors may be attached.

The Amidon scaffolding consists of lengths of standard steel pipe fastened together with one or more of three different types of fittings. The first of these is the three-way fitting for connecting longitudinal, transverse and vertical pipes into a single corner joint, and for attaching one or two

(Continued on page 962)

Why is equal tension important, too?

Adequate tension and high reaction (the highest reactive value in the entire field of spring washers) are important advantages of the Verona Fixed Tension Triflex Spring; but equal tension, made possible by the exclusive "gauge design" which provides the means for fixing the tension on each bolt, is an important safety factor in preventing track buckling and pull-aparts.

The world's Finest Spring Washer

VERONA *Fixed* TENSION TRIFLEX SPRING

We also make a complete line of alloy coil washers to A.R.E.A. 1948 requirements.

Woodings-Verona

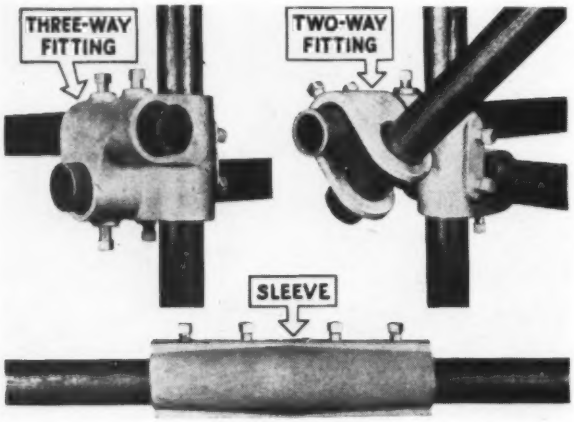
TOOL WORKS

For additional information on any of the products described on these pages, use postcards, page 903.

diagonal braces. The second is the two-way fitting for fastening two pipes at right angles to each other, as in attaching single diagonals, outboard brackets, guard rails and ladder rungs. This fitting also permits erecting the scaffold to fit around circular structures and to fit bends of any angle. The third fitting is the sleeve for joining lengths of pipe.

Erection of the scaffolding involves only sliding the pipe into the fittings and tightening two set screws at each joint. No special skill is required, and one man can do the job. Dismantling is equally easy.

According to the manufacturer, with a horizontal and vertical spacing of 66 in. between pipes, Amidon scaffolding will safely support a working load of 3,000 lb. on each 66-in. square. Cross bracing may be quickly installed wherever desired, and the fittings fasten all members into a rigid unit structure.



The Amidon scaffolding consists of lengths of standard steel pipe fastened together by one or more of these three types of fittings

What Our Readers Think

SHORT CUTS ARE KEY TO MORE PRODUCTION

Chicago, Ill.

TO THE EDITOR:

SINCE the 40-hr work week became effective, various articles have appeared in "our" magazine, **Railway Engineering and Maintenance**, dealing with the question of what methods should be employed by supervisory forces to obtain maximum production. Much though has been given to the intensive use of machinery, the extensive employment of extra gangs, the lengthening of sections, and various experimental solutions to the problem.

However, I am not yet satisfied that our aims will be fully met unless we give more thought to the development of foreman and other supervisory forces. These forces are the key men and their leadership is the bridge between railway officers on the one side and the use of labor, material and machinery on the other. Roadmasters or track supervisors, general track foremen, section or extra gang foremen and assistant track foremen constitute our supervisory forces. They are the ones who manage every dollar spent for track maintenance and railway officers look to this group of men for value received from every dollar invested.

Realizing that good supervision is the key to maximum production, railway officers are selecting, insofar as possible, experienced or otherwise-qualified men for these positions. The best of these men, in turn, realize that knowing the short cuts and taking advantage of them are the real keys to maximum production. It is by the way of short cuts that the supervisor can dispose of each and every operation in a number of different ways.

No definite method can be laid down for an individual supervisor to do his work or discharge all of his responsibilities. Instead he must be continually on the alert seeking better and shorter ways to get his work done. For instance, there may be a time of the year when a certain job can be accomplished much more economically than at other times. The supervisor who is conscious of short cuts will take advantage of such times in programming his work.

I remember when it took nearly four months to lay 23 miles of 65-lb. rail with a gang of 50 to 60 men. No one would question the fact that today, under our present system of gang organization based on maximum use of machines, the same amaount of rail can be laid in 15 days or less. Have we progressed as much in methods of training our supervisory forces—from assistant foremen on up? Are we teaching them the short cuts? If we aren't, how can we teach them? Railway management should consider this problem seriously, for if it is not solved and untrained men are given heavy responsibilities before they know the short-cuts, the railways will have to pay for their mistakes.

Not only must the supervisors of men be adequately trained but, because we are moving more rapidly toward the use of machinery today than ever before, the supervisors of machines must also be trained. Machines constitute one of the best investments made by the railways for handling maintenance-of-way work. To be such good investments, these machines require good supervision, good foremen and good operators.

The 40-hr. work week will no longer be a problem when our direct attention is given to the building up of good foreman and machine operators and when the railways make sure that eveyone in direct charge of labor and material—be he a roadmaster, a track supervisor, a general foreman, a foreman, or an assistant foreman—strives for a shorter way to get his work done.

N. F. ALBERT
General Track Foreman
Chicago, Milwaukee, St. Paul & Pacific

"I SURE KEPT MY FINGERS CROSSED

all summer while you applied poisonous 'HERBICIDOL' "

You were fearful of livestock claims?

We have always considered the old type poisonous weed killer by far the most destructive. However our management frowned on stock losses.
It was difficult to credit your statement that "Herbicidol" with the same poisonous base would not again involve us in livestock claims. We have used a weed killer of recent years which is safe as related to livestock losses. But we regarded the effects as a blight or top kill.

The one tank car of "OL" that you persuaded us to purchase last year confirms your claim that this product duplicates the kill of the old poisonous weed killer. With some element of uncertainty we went all out this year to obtain the superior kill of "OL" but we still kept our fingers crossed on the cattle losses.

Are you now sold on its safety features?

We treated some 2,000 miles. We not only have plenty of cattle, but most of it is pedigreed stock. We have not had a single stock claim. We regard the kill as the best we have had since the days when we discontinued using poisonous "Herbicide." We plan to extend the use of "OL" next year now that we have "faith."

This is an actual report for the growing season of 1950. We have many others duplicating this experience.

We stand ready to prove to you at our own expense that you can have the kill which only a poisonous base weed killer will contribute, without risk of livestock claims.

A review of your weed control program is invited.

READE MANUFACTURING COMPANY, INC.

Executive Headquarters
135 Hoboken Avenue
Jersey City 2, N. J.

Service Headquarters
9500 Cottage Grove Avenue
Chicago 28, Illinois

PLANTS IN NUMEROUS RAILROAD CENTERS

THE MONTH'S NEWS

Happenings among the railways — the associations — the suppliers

Changes in Railway Personnel

Engineering

A. C. Oxley, assistant engineer on the Canadian National at Montreal, Que., recently retired after 29 years of service.

Leonard G. Wallis, assistant engineer on the Southern at Washington, D. C., has retired after 36 years of service.

Julian J. Attaway and **Thomas H. Whitfield, Jr.,** have been appointed assistant engineers in the engineering department of the Central of Georgia.

Clifford G. Davis, division engineer on the Kansas City Southern, has been promoted to assistant chief engineer, with headquarters as before at Kansas City, Mo.

George F. Nigh, assistant division engineer on the New York, Chicago & St. Louis at Frankfort, Ind., has been appointed resident engineer at Calumet, Ill., succeeding **Walter E. Webb,** who has been promoted to architectural engineer at Cleveland, Ohio.

G. W. Miller, whose appointment as engineer maintenance of way of the Eastern region of the Canadian Pacific at Toronto, Ont., was announced in the

G. W. Miller

August issue, was graduated from the University of British Columbia and joined the C.P.R. as a transitman at Vancouver, B. C., in 1927. He subsequently served as roadmaster on the Kootenay division and division engineer at Revelstoke, B. C. In 1939 Mr. Miller became assistant engineer in the office of the chief engineer at Montreal, Que., and four years later was appointed assistant engineer maintenance of way, Eastern region, at Toronto. He was named district engineer of the Ontario district in 1946 and two years later again became assistant engineer maintenance of way, of the Eastern region, which position he held until his recent promotion.

Roy N. Brodie, assistant structural engineer of the Boston & Maine, has been promoted to engineer of structures

Roy N. Brodie

of the Boston & Maine, Maine Central and Portland Terminal Company, with Headquarters at Boston, Mass., succeeding **Benjamin W. Guppy,** who has retired. **Thomas K. Dyer,** project engineer, has succeeded Mr. Brodie. Mr. Brodie, who received his higher education at Truro College, England and at the Massachusetts Institute of Technology, entered railroad service with the Canadian Pacific in Montreal, Que., in 1914, and later served with the Missouri-Kansas-Texas, in St. Louis, Mo. He joined the B. & M. in August, 1928, as a designer, becoming assistant structural engineer in 1944.

Mr. Guppy began service with the Boston & Maine as a transitman upon graduation from the Massachusetts Institute of Technology on June 18, 1889. He was appointed bridge engineer on the Maine Central in 1899, and, in 1909, became engineer of structures of the B. & M., assuming the same duties with the Maine Central and Portland Terminal Company in 1933. Serving

Benjamin W. Guppy

with the 14th Engineers, Mr. Guppy was in military service from May, 1917, to February, 1919, as major and lieutenant colonel. From October, 1918, to January, 1919, he was superintendent of port terminal facilities at St. Mazaire, France.

R. W. Doerr, assistant cost engineer of the Miami, Middle and Wabash districts, Chicago division, of the Chesapeake & Ohio, has been appointed assistant cost engineer of the Miami and Middle districts, and **G. R. Jenkins, Jr.,** instrumentman on the Chicago division, has been advanced to assistant cost engineer of the Wabash district.

L. W. Koenig, assistant engineer on the New York Central, has been appointed assistant engineer in the district engineer's office with headquarters as before at Detroit, Mich., succeeding **E. L. Smith** who has retired.

B. G. Packard, division engineer, of the Dakota division of the Chicago & North Western, at Huron, S. D., has been transferred to the Galena division, with headqquarters at Chicago, succeeding **C. E. Hise,** who has been appointed office engineer in the chief engineer's office, at Chicago. Mr. Hise succeeds **L. J. Deno,** who has been appointed division engineer on the Peninsula division at Escanaba, Mich.,

succeeding **R. D. Culbertson.** Mr. Culbertson has been transferred to Huron to succeed Mr. Packard.

W. C. Whitman, who was recently appointed division engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Terre Haute, Ind.,

W. C. Whitham

as noted in the September issue, was born at Scotland, S. D., on June 21, 1915. He graduated from the South Dakota State School of Mines in 1937, with a Bachelor of Science degree in civil engineering, and began service with the Milwaukee in August, 1937, as a rodman at LaCrosse, Wis. In 1939, Mr. Whitman was appointed instrumentman at Aberdeen, S. D., and served in that capacity until February, 1943, at which time he joined the U. S. Army. After serving with the 708th railway grand division as engineer of track for three years, he returned to the Milwaukee in February, 1946, as assistant division engineer at Savanna, Ill. On January 1, 1950, he was appointed division engineer on the Kansas City division at Ottumwa, Ill., serving in that capacity until that division was consolidated with the Dubuque & Illinois division. From April to August of this year, Mr. Whitham served as assistant division engineer which position he held until his promotion.

R. A. Emerson, engineer of track of the Canadian Pacific has been promoted to assistant chief engineer, with headquarters at before at Montreal, Que., succeeding **Robert B. Jones,** who retired under the company's pension regulations on October 1. Mr. Emerson was born at Plum Coulee, Man., on April 12, 1911, and began his service with the C.P.R. in the engineering department in 1928, on a summer basis while attending the University of Manitoba. In 1933 he was awarded one of the five Strathcona scholarships in transportation given annually by the graduate school of Yale university, and carried out his post-graduate studies at New Haven, Conn., in 1933 and 1934. Mr. Emerson's permanent career with the C.P.R. engineering department started in 1935 as transitman atRevelstoke, B. C.,

(Continued on page 966)

RUST-OLEUM

RUST-OLEUM is unequalled for lasting protection against the ravages of rust. It's the practical answer to most railroad rust problems because it can be applied to surfaces already rusted without extensive surface preparation. For 25 years — on major railroads—RUST-OLEUM has proved its capacity to stop and prevent costly rust — on bridges, rolling stock, tanks, metal buildings, metal equipment and other structures.

An exclusive formula, RUST-OLEUM adds years of extra use to all metal surfaces. It cuts maintenance costs — indoors and out. RUST-OLEUM'S tough, pliable film dries to a firm finish that defies rain, snow, salt air, fumes, weathering, etc.

Where rust has already started, RUST-OLEUM can be applied effectively and economically. Scraping and wirebrushing to remove rust scale and dirt is all that is usually required. RUST-OLEUM merges the remaining rust into durable, rust-resisting coating that protects the metal against the elements. Use it in all your maintenance work on all exposed metal. Specify it on all new equipment or structures to be sure of maximum results at the lowest cost, with assurance of the best foundation coat.

Get the facts! . . . Write for complete data and recommended applications. Tell us your rust problems.

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RAILROADS ARE

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TO PENTA-TREATED WOOD

It's safe from insect attack and decay

Wherever you use wood you'll find it pays to use PENTA-protected wood. PENTA is the **clean** preservative that stops decay and termites . . . multiplies the life of wood two to four times . . . holds down maintenance expenses.

Car lumber, sheds, platforms, poles and other wood construction all need the dependable protection PENTA gives. It penetrates deeply for lasting protection, doesn't leach out.

Why not find out how PENTA-protected lumber can serve your road. Write or phone and we'll have a wood preservative specialist consult you.

CHAPMAN CHEMICAL COMPANY • Dermon Bldg., Memphis 3, Tenn.

CHAPMAN®

PENTA PRESERVATIVE

It's Clean! It's Certain!

CONFORMING TO A.W.P.A. SPECIFICATIONS P8-49 AND P9-49

Railway Personnel (Cont'd)

and one year later he transferred to the Regina (Sask.) division. He was appointed roadmaster on the Manitoba district in 1939, and division engineer of the Brandon division in 1941, transferring to the Moose Jaw division in 1943. Mr. Emerson became assistant district engineer of the British Columbia

R. A. Emerson

district at Vancouver, B. C., in 1944, and was promoted to district engineer of that district two years later. In March, 1948, he was appointed engineer of track of the system at Montreal, in which position he served until his recent promotion.

Mr. Jones was born in Glasgow, Scotland, on March 21, 1885. After serving an apprenticeship in railway engineering with the North British Railway

Robert B. Jones

in Scotland, he entered the service of the Grand Trunk Pacific (now C.N.R.) in 1910, and was employed on the design and construction of the mission terminal at Fort William, Ont., and later on surveys and location in Saskatchewan. His Canadian Pacific service, which commenced March 21, 1913, has included track revision, survey and location work along the north Shore of Lake Superior, and he has been associated with extensive changes in track

standards and terminal design. Following military service from 1915 to 1919, Mr. Jones was appointed assistant engineer in the office of the chief engineer at Montreal. In 1939, he was advanced to engineer of track of the system, and to assistant chief engineer on January 1, 1946.

S. H. Shepley, assistant chief engineer of the Elgin, Joliet & Eastern, at Joliet, Ill., has been assigned to rearrangement of yard facilities at Gary, Ind., of which project he will be in direct charge, with headquarters at Gary. While on this assignment, Mr. Shepley's former duties and responsibilities in the maintenance of way department will be assumed by **A. C. Hoyt,** engineer bridges and buildings at Joliet, who becomes engineer maintenance of way at that point. **A. C. Johnson,** engineer of design,, at East Joliet, Ill., assumes Mr. Hoyt's duties as engineer bridges and buildings.

Track

J. T. E. Levesque, roadmaster on the Laurentian division of the Canadian National, recently retired after 33 years of service.

J. A. Bubenyak, section foreman on the Chicago, Rock Island & Pacific, has been promoted to roadmaster at Wichita, Kan., succeeding **E. Rohloff,** who has been transferred to St. Joseph, Mo.

Clark Hungerford, Jr., has been appointed assistant track supervisor on the Southern at Knoxville, Tenn.; **Nick D. Newton** has been made assistant track supervisor at John Sevier, Tenn.; and **Carl R. Perkins** is now assistant track supervisor at Bulls Gap, Tenn.

W. Ringlbauer has been appointed roadmaster on the Chicago, Milwaukee, St. Paul & Pacific at Mitchell, S. D., to succeed **L. C. Blanchard,** who has been transferred to the Twin City terminals with headquarters at Minneapolis, Minn. Mr. Blanchard replaces **Robert J. O'Connor,** who has retired.

C. B. Wilkes, supervisor of track on the Chicago & Eastern Illinois, with headquarters at Villa Grove, Ill., has retired. The position of track supervisor at Villa Grove has been abolished and the jurisdiction of **P. W. Piper,** supervisor of track at Salem, Ill., has been extended to include the territory over which Mr. Wilkes formerly had jurisdiction.

C. T. Popma, assistant supervisor of bridges and buildings on the New York Central, with headquarters at Detroit, Mich., has been appointed supervisor of track at Jackson, Mich., succeeding **Thomas Henning,** who has retired.

A. J. Heacox, assistant supervisor of track on the Middle division of the Pennsyylvania, at Newport, Pa., has been promoted to supervisor of track on the Fort Wayne division, with headquarters at Grand Rapids, Mich., succeeding **M. K.**

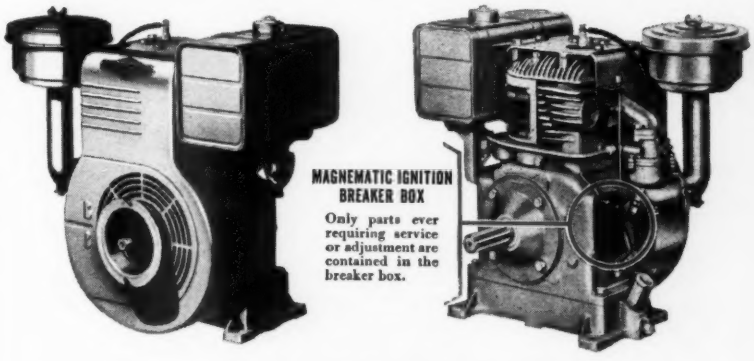
(Continued on page 968)

ONLY BRIGGS & STRATTON HAS THE MODERN

Magnematic Ignition

(Patents Pending)

STANDARD EQUIPMENT ON MODELS 9-14-23



A Dependable Spark For Better Engine Performance at ALL SPEEDS

Magnematic Ignition delivers a dependable spark at lower speeds and better engine performance at all speeds.

LONG SPARK PLUG LIFE — magneto output tailored to engine requirements — sparks only on firing stroke — voltage decreases as speed increases, substantially lengthening spark plug life.

AUTOMATIC SPARK ADVANCE — spark is retarded at starting speed and automatically advanced as engine speed increases.

QUICK, EASY STARTING — pull-up cranking with no danger of a "kick" during rope or hand cranking.

SEALED, WATERPROOF COIL — one piece, plastic insulated coil, fully sealed and waterproofed with molded-in high tension lead.

SIMPLE AND DEPENDABLE — no extra gears, bearings or lubrication system.

EASY TO SERVICE — only parts ever requiring service or adjustment accessible by removing breaker-box cover conveniently mounted outside crankcase.

Magnematic Ignition is another exclusive Briggs & Stratton development which is setting new standards of performance for single-cylinder, air-cooled engines.

Write for bulletin giving complete information on Magnematic Ignition and Briggs & Stratton engines.

BRIGGS & STRATTON CORP., Milwaukee 1, Wis., U. S. A.

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

Preferred Power FOR INDUSTRIAL CONSTRUCTION RAILROAD AND FARM EQUIPMENT

World Wide FACTORY SUPERVISED SERVICE

In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.

BORASCU* *treatment proved more effective—and lasting—than shovel cutting or hand scalping . . . resulted in savings of as much as $1.66 per lineal foot of trestle per year for this class of work* . . . so reports one major road. To reap such important savings, have *your* section hands apply safe, non-corrosive, low-priced BORASCU* about your bridges, trestles, tie piles and buildings now . . . it's the easy, thrifty way to destroy fire-hazardous weeds and grasses!

*Reg. U. S. Pat. Office

Weed Control Dept. Representatives located in the following cities: CHICAGO • NEW YORK CITY • SEATTLE • PORTLAND, ORE. • CLEVELAND, OHIO • AUBURN, ALA. • MANHATTAN, KAN. • HOUSTON, TEX. • FT. WORTH, TEX. • SIOUX CITY, IOWA • BOZEMAN, MONT. • MINNEAPOLIS, MINN. • SAN FRANCISCO • Home Office: 510 W. SIXTH STREET, LOS ANGELES 14, CALIFORNIA

PACIFIC COAST BORAX CO.
DIVISION OF BORAX CONSOLIDATED, LIMITED
510 WEST SIXTH STREET • LOS ANGELES 14, CALIFORNIA

Railway Personnel (Cont'd)

Clark, who has been transferred to New Castle, Pa. Mr. Clark succeeds **J. J. Baffa,** who has been transferred to the Southwestern division at Terre Haute, Ind., to succeed **I. C. Golab.** Mr. Golab has been transferred to Lancaster, Pa., succeeding **A. M. Schofield,** who has entered military service. **R. E. Christ,** assistant supervisor of track at Orrville, Ohio, has been appointed supervisor of track at Alliance, Ohio, succeeding **W. B. Knight,** who has been transferred to the Southwestern division at Terre Haute. Mr. Knight succeeds **R. D. Jordan, Jr.,** who in turn succeeds **J. L. Forrester** on the Eastern division at Alliance. Mr. Forrester left the railroad to enter military service. **W. B. Newell,** junior engineer on the Eastern region, has been appointed assistant supervisor of track on the Chicago division, succeeding **L. E. Ward,** who has been transferred to the Middle division at Newport, succeeding Mr. Heacox. **C. N. Edwards,** junior engineer on the Western Region, has been appointed assistant branch line supervisor of track on the New York division at Jamesburg, N. J., succeeding **A. J. Syvertsen,** who has been appointed assistant supervisor of track on the panhandle division at Carnegie, Pa. Mr. Syvertsen succeeds **W. E. Hilterbeitel,** who, in turn, succeeds Mr. Christ at Orrville, Ohio.

Bridge and Building

L. E. Benner has been appointed assistant supervisor of bridges and buildings on the New York Central, with headquarters at Detroit, Mich., succeeding **C. T. Popma,** whose promotion to supervisor of track is noted elsewhere in this issue.

Obituary

Frederick G. Vent, retired assistant engineer on the Illinois Central, Chicago, died on August 6.

John P. Hanley, retired assistant superintendent water service on the Illinois Central, died on July 26.

A. C. Paynter, assistant engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, died on September 16.

James C. Powell, retired valuation engineer on the New York Central, died recently at Cleveland, Ohio.

William E. Maley, retired supervisor of bridges and buildings on the Buffalo division of the Baltimore & Ohio, died recently at DuBois, Pa.

J. H. Davidson, retired water engineer of the Missouri-Kansas-Texas, died at his home in Parsons, Kan., on August 23. He was 68 years old.

R. W. Willis, who retired as assistant chief engineer of the Chicago, Burlington & Quincy, at Chicago, in October, 1947, died on September 1.

Association News

Bridge and Building Association

The association held its annual meeting in Chicago, September 18-20, concurrent with the annual convention of the Roadmasters' and Maintenance of Way Association. Joint features of the two programs are reported in the Roadmasters' section of this issue. Detailed reference to the separate features of the Bridge and Building program, including the printing of the committe reports in full, and abstracts of the discussions which followed their presentation, will appear in the November issue.

Maintenance of Way Club of Chicago

The first fall meeting of the club will be held on October 23 at the same location where the meetings have been held for several years, namely, at Eitel's

(Continued on page 970)

Meetings and Conventions

American Railway Bridge and Building Association—Elise LaChance, Secretary, 431 S. Dearborn Street, Chicago 5.

American Railway Engineering Association—Annual Meeting, March 13-15, 1951, Chicago. Neal D. Howard, Secretary, 59 E. Van Buren street, Chicago 5.

American Wood-Preservers' Association—Annual meeting, April 24-26, 1951, Stevens Hotel, Chicago. H. L. Dawson, Secretary-treasurer, 839 Seventeenth Street, N. W., Washington 6, D. C.

Bridge and Building Supply Men's Association—E. C. Gunther, Secretary, 122 S. Michigan Avenue, Chicago 3.

Maintenance of Way Club of Chicago—Next meeting October 23, 1950. E. C. Patterson, Secretary-treasurer Room 1512, 400 W. Madison street, Chicago 6.

Metropolitan Maintenance of Way Club—Secretary, 30 Church street, New York.

National Railway Appliance Association—R. B. Fisher, Secretary; Lewis Thomas, assistant, Secretary 59 E. Van Buren street, Chicago 5.

Railway Tie Association—Roy M. Edmonds, Secretary-treasurer, 610 Shell Building, St. Louis 3, Mo.

Roadmasters' and Maintenance of Way Association of America—Elise LaChance, Secretary, 431 S. Dearborn street, Chicago 5.

Track Supply Association—Lewis Thomas, Secretary, 59 E. Van Buren street, Chicago, 5.

CUT YOUR COST-PER-MILE

Simplex Jacks at work

Working ahead of an automatic multiple tamper, light-weight Simplex aluminum alloy track jacks help speed track maintenance.

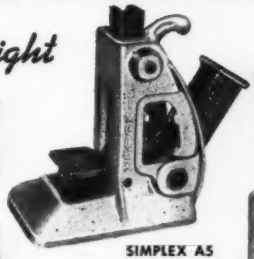
on track maintenance and construction

with NEW, light-weight

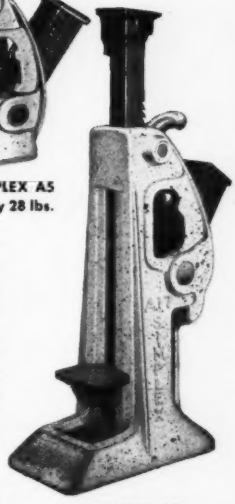
SIMPLEX

ALUMINUM ALLOY

TRACK JACKS



SIMPLEX A5
Weighs only 28 lbs.



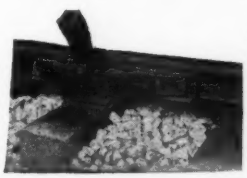
SIMPLEX A17
Weighs only 41½ lbs.

Speed of jacking, portability of jacks—with every precaution for safety of crew—are important parts of your cost-per-mile of track. Simplex Track Jacks are engineered to help you get the fastest, easiest jacking—every inch of the way. All housing sections have been increased 40% to compensate for the lesser strength of aluminum alloy. They set much more firmly and stand straighter under tie (without damage) or rail, due to the 2½" x 3¼" forged and machined toe lift. Both lift full 15 ton capacity on either cap or toe.

Simplex Jack A5 is especially suited for surfacing, lining (up to 2"), tie plate renewal, in conjunction with automatic ballast-placing or tamping machines. Simplex Jack A17 is for general-duty jacking.

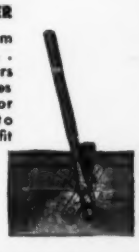
SIMPLEX RAIL EXPANDERS

Avoid battered rail ends, bolts and crossings with this easy-to-use 25-ton capacity rail expander. Available also in 15 and 30 ton capacities.



SIMPLEX G-Y TIE SPACER

Saves ties from being sledged . . . reduces man hours . . . easily moves ties forward or backward into place. Made to fit any type of rail.



SEND FOR BULLETIN: TRACK 50

Simplex LEVER - SCREW - HYDRAULIC Jacks

TEMPLETON, KENLY & CO.
1026 S. Central Ave., Chicago 44, Ill.

restaurant, in the Field building, Clark and Adams streets. This meeting will be addressed by George M. O'Rourke, assistant engineer maintenance of way, Illinois Central, who will give a first-hand account of the condition and maintenance practices of the German railroads. Earlier this year Mr. O'Rourke spent three months in Germany studying the railroads as one of a group of railroad men who were commissioned to make a report on the German lines by the Economic Cooperation Administration. Mr. O'Rourke will have a fascinating story to tell, and his remarks will be illustrated by slides showing the condition of the German railroads as well as cities and other facilities.

American Railway Engineering Association

C. J. Geyer, vice-president—construction and maintenance, Chesapeake & Ohio, Richmond, Va., has been elected junior vice-president of the American Railway Engineering Association, by the Board of Direction of that association, to fill the vacancy created by the recent advancement of T. A. Blair to senior vice-president, in the move which also saw H. S. Loeffler elevated to the presidency to succeed G. L. Sitton. Mr. Blair is chief engineer of the Atchison, Topeka & Santa Fe System, Chicago, and Mr. Loeffler is assistant chief engineer of the Great Northern, St. Paul, Minn.

Mr. Geyer joined the association in 1921, was elected a director in 1938, junior vice-president in 1945, and senior vice-president in 1946. He resigned as senior vice-president in the year in which he was elected.

The reinstatement of Mr. Geyer as junior vice-president adds to the officers of the association a man with a long and distinguished background in the engineering and maintenance departments of the C&O., and one who has engaged in many A.R.E.A. activities over the years, which saw him as chairman of the Committee on Track from April, 1934, to March, 1939, and, at various periods of time, a member of six other committees.

Three technical committees have scheduled meetings for this month. The Committee on Iron and Steel Structures will meet at the Sheraton hotel, St. Louis, Mo., October 17-18; the Committee on Economics of Railway Labor will meet on October 27 at association headquarters, Chicago; and the Committee on Cooperative Relations with Universities will meet on October 25, also at association headquarters, Chicago.

Railway Tie Association

The Railway Tie Association held its thirty-second annual meeting at the Brown Hotel, Louisville, Ky., August 28-30. The attendance totaled approximately 325 members and guests, of whom 99 were railroad men. Features of the three-day meeting of particular interest to railroad men were addresses by Wayne A. Johnston, president, Illinois Central, on Partners in the Railroad Industry; by C. H. Blackman, chief engineer, Louisville & Nashville on One Hundred Years of Ties on the L.&N.; by Clarence S. Burt, assistant to vice-president, purchases and stores, Illinois Central, and R. Van Metre, president, Wyoming Tie & Timber Co., both on The Last 50 Years and the Next in the Crosstie Industry; by G. M. Magee, research engineer, Engineering division, Association of American Railroads, on What the A.A.R. Is Doing to Extend Service Life of Ties; by W. E. Tiller, president, Tiller Tie & Lumber Co., on As a Man Sees the Next 12 Months; and by Paul D. Brentlinger, forester, Pennsylvania, on Stacking Crossties for Seasoning.

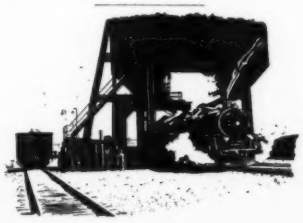
Committee reports of particular in-

(Continued on page 972)

A COMPLETE LINE OF
Proven
WEED KILLERS

CHIPMAN CHEMICAL COMPANY, INC.
Chicago, Ill. • BOUND BROOK, N. J. • Pasadena, Texas
N. Kansas City, Mo. • Palo Alto, Cal. • Portland, Ore.

RAILROAD WEED CONTROL SERVICE SINCE 1912



TRAXCAVATOR

Quickly Clears Snow off Regina, Sask., Yards!

Blizzards hit Regina, Saskatchewan, *special delivery*, direct from the frigid Yukon. Temperatures tumble. Snow compacts; gets tough!

That's when they sic an HT4 Hydraulic TRAXCAVATOR on the snow, and clear the Canadian Pacific yards quick. For the HT4's "Caterpillar" Diesel Engine is a sure-starter, even in extreme cold. Sure traction means action to crowd the heavily-reinforced steel bucket full of ice-like snow.

This TRAXCAVATOR-Tractor combination promotes man-saving efficiency, winter or summer, on dozens of railroading jobs. Railroad companies are fitting key off-track maintenance and modernization work with all 5 TRAXCAVATOR models (½ to 4 cubic yards capacity).

Request information from your TRACKSON-"Caterpillar" Dealer, or write to TRACKSON COMPANY, Dept. RE-100, Milwaukee 1, Wis.

TRAXCAVATOR®

The Original Tractor Excavator

BEALL

Spring Washers

BEALL TOOL DIVISION

Association News (Cont'd)

terest to users of crossties were those of the Committee on Checking and Splitting of Crossties, of which J. A. Vaughn, Southern Wood Preserving Company, was chairman; on Mechanical Handling of Crossties, of which John Wright, Koppers Company, was chairman; and on Timber Conservation, of which D. B. Mabry, the T. J. Moss Tie Company was chairman.

In the election of officers W. P. Arnold, executive assistant to the vice-president and general manager of the Wood Preserving Division, Koppers Company, Pittsburgh, Pa., was advanced from first vice-president to president; J. R. Keig, Kirby Lumber Corporation, Beaumont, Tex., was advanced from second vice-president to first vice-president, and W. J. Chambliss, Bond Bros., Louisville, Ky., was elected second vice-president. Elected to the Executive committee were Harry Dunstan, Southern Wood Preserving Company, Atlanta, Ga.; Fred Mewhinney, Gillis & Co., Chicago; J. E. Peterson, Gross & Janes Co., St. Louis, Mo.; M. S. Hudson, Taylor-Colquitt Co., Spartanburg, S. C.; and E; W. Jones, T. J. Moss Tie Co., St. Louis, Mo. Roy M. Edmonds was re-elected secretary-treasurer by the Executive committee.

BALLAST IS SCREENED BY CONTRACT — ELIMINATING INVESTMENT BY RAILROADS IN THIS ONE OPERATION EQUIPMENT . . .

Stone ballast cleaned by the Speno method is thoroughly cleaned because it is screened twice. In order to obtain a thorough cleaning, two passes are necessary to restore the ballast to as clean a condition as when it was originally placed in the track. The two passes are accomplished in less time than a single pass by other mechanical methods.

Preferably, the ballast is cleaned ahead of a general track raise, and under the Speno method, no cribbing is necessary. Because of the drainage that the Speno method attains, the cleaning lasts from one general raise until it is time for another general raise, normally over a period of from three to six years, depending on conditions.

Speno equipment, working under traffic without interference with railroad operation, (the track adjacent to the one being worked is not fouled by our equipment in working position) easily keeps ahead of track raising programs.

The high production and low cost of this service are worthy of consideration.

FRANK SPENO RAILROAD BALLAST CLEANING CO. INC.

306 North Cayuga Street — Ithaca, New York

Supply Trade News

General

The **McCulloch Motors Corporation** is progressing a $2,500,000 expansion program which will increase the productive space and capacity of its Los Angeles (Cal.) plant by 300 per cent. The program includes the addition of eight new manufacturing bays, a recreation-cafeteria building, and engineering and warehousing facilities. Started in June, 1950, the expansion program is scheduled for completion in June, 1951.

The **Hyster Company,** Portland, Ore., has appointed the **Ortner Company,** Terrace Plaza building, Cincinnati, Ohio, as special sales representative to contact a number of eastern railroads in connection with Hyster lift trucks, turret trucks, straddle trucks, attachments and parts.

The **Monsanto Chemical Company,** St. Louis, Mo., has registered a brand to identify construction lumber and other wood items treated with Monsanto's pentachlorophenol. The brand will be licensed to plants qualified to treat wood by the vacuum-pressure process in accordance with specifications being established by the company. The identifying mark, a pentagon containing penta content and other information, is to be indelibly stamped onto each piece meeting the specifications.

The **Pettibone Mulliken Corporation,** of Chicago, producers of track materials and materials-handling equipment, has acquired the assets of the **Cleveland Frog & Crossing Co.** of Cleveland, Ohio. The Cleveland firm will continue to be operated as a separate, but wholly owned, subsidiary. There will be no changes in personnel other than that **E. J. Seifert,** president of Pettibone, will become chairman of Cleveland's board, and **E. S. Cummings,** Pettibone secretary, will have similar duties with the newly acquired firm.

Personal

Iron & Steel Products, Inc., Chicago, Ill., has announced that **W. E. Corr,** at Norfolk, Va., is no longer associated with this company.

John Lundahl has been appointed to the newly-created position of sales representative-at-large by the Detroit Diesel Engine Division of the **General Motors Corporation.**

C. M. Shaw, assistant treasurer of the Wood Preserving Division of **Koppers Company, Inc.,** Pittsburgh, Pa., has been appointed manager of the division's finance department, succeeding **L. S. Graham,** who has retired.

(Please turn to page 974)

Cut Bridge Fire Expense . . . . INVESTIGATE THE LIBBEY-ZONE PROCESS

Leading Roads Achieving Remarkable Success in Restricting Bridge and Trestle Fire Damage

EASY TO APPLY — LASTS FOR YEARS

The photograph above was selected at random from our files. Many leading railroads (names furnished gladly upon request) are now restricting fires on wooden structures with the effective Libbey-Zone Process. One large system, whose experience is covered in the article on page 640 of the July issue, has now treated over a thousand structures with highly gratifying results.

"ZONE" HEAVY-DUTY COATING, when combined with the proper aggregate of crushed stone or gravel, expands with heat . . . yet does not melt; contracts with cold . . . yet does not flake! Applied cold, the compound's resilient protective coating stretches over cracks and sinks into low spots, yet maintains an even spread and holds aggregate firmly in place. "ZONE" HEAVY-DUTY COATING is easily and quickly applied by unskilled workers.

Write for Descriptive Booklet and complete engineering information . . .

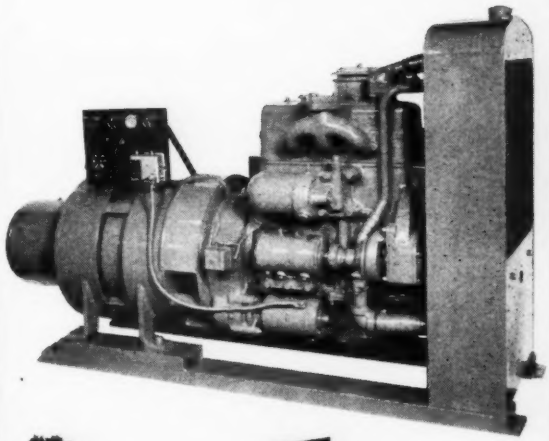
We suggest you write in detail, mentioning if possible specific bridge fire problems of your road. We will send you complete information, including our descriptive booklet and recommendations . . . without obligation, of course.

THE ZONE COMPANY

A Division of the Southwestern Petroleum Company

FORT WORTH 1, TEXAS

Just one repair in 10 years of use!



This kind of dependability cuts costs for railroads too!

A "US" 15-KW Diesel-driven Electric Plant has operated approximately 6500 hours in this garage in Hadley, Mass., without once having the head off. The *only* repair has been the replacing of a bolt in the coupling! Just one more proof that "US" simple design and rugged construction pay off! There's a "US" unit for every railroad use. Write for information.

UNITED STATES MOTORS CORPORATION — US — OSHKOSH, WISCONSIN

UNITED STATES MOTORS CORP.

438 Nebraska Street
Oshkosh, Wisconsin

"US" Builds an Electric Plant for Every Railroad Need.

Supply Trade News (Cont'd)

The **Harnischfeger Corporation** has announced the transfer of **P. C. Petry**, sales representative at Milwaukee, Wis., to Philadelphia, Pa.

The **Rinshed-Mason Company**, Detroit, Mich., has purchased the former Caltone plant, at 1440 N. Lemon street, Anaheim, Cal. **Edward S. Hawkins**, director of automotive finishes at Detroit, will be general manager of the new western division.

Kenneth G. Lundie, sales manager of the **Johnston Pump Company**, Los Angeles, Cal., has been elected vice-president in charge of sales, and **Perry Brown**, chief engineer, has been elected vice-president in charge of engineering.

Robert E. Cramer, chief engineer of the **American Steel & Wire Co.** has been appointed to the newly-created position of chief engineer of the Cyclone Fence Division of the company, with headquarters as before at Cleveland, Ohio. Mr. Cramer is succeeded by **Harry L. Jenter**, general superintendent of the company's Cuyahoga Works at Cleveland.

Obituary

Walter L. Turner, Jr., eastern editor of ***Railway Engineering and Maintenance***, and eastern engineering editor of ***Railway Age***, died at the Paterson General Hospital, Paterson, N. J., on September 1, following a protracted illness.

Mr. Turner was born at Bluefield, W. Va., on January 27, 1913, and was educated at Virginia Polytechnic Institute from which he was graduated with the degree of Bachelor of Science in Civil Engineering in 1935.

He entered railroad service on April 23, 1936, as a rodman in the office of the chief engineer of the Central region of the Pennsylvania, serving in that capacity at various locations until March 15, 1937, when he became an engineer apprentice on the Pennsylvania's Buffalo division at Buffalo, N. Y. Subsequently, from September 16, 1937, to April 5, 1938, he was assistant on the engineering corps of the railroad's Buffalo, Eastern and Pittsburgh divisions.

On April 15, 1938, Mr. Turner became a party chief for the Pennsylvania Turnpike Commission, with headquarters at Bedford, Pa., where he remained until his return to railroad service on February 1, 1939, as assistant on the engineering corps of the P. R. R.'s Eastern division at Alliance, Ohio. He later served in the same capacity on the E. & A. division at Niles, Ohio, from November 16, 1939, to May 31, 1940, and in the office of the chief engineer maintenance of way, Central region, at Pittsburgh, Pa., from June 1, 1940, to October 15 of the same year. On the latter date he became assistant supervisor of track on the Williamsport division at Lock Haven, Pa., remaining in that position until he was called into active military service on March 28, 1941.

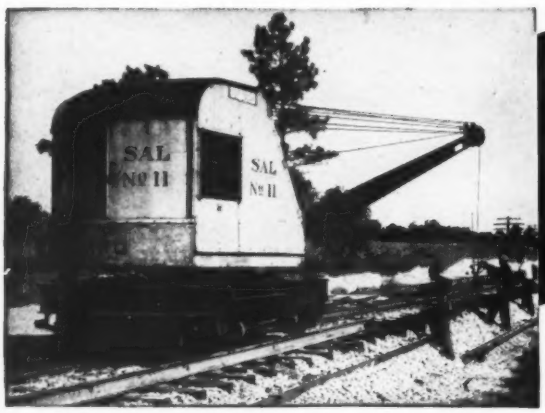
Walter L. Turner, Jr.

From then until November 30, 1945, he served in this country and in Panama as a first lieutenant, captain and major in the Coast Artillery Corps of the United States Army, returning to the Pennsylvania on December 1, 1945, as assistant supervisor of track on the Eastern division at Freedom, Pa.

Mr. Turner's association with Simmons-Boardman railway publications dated from April 23, 1946, when he was employed as an associate editor of ***Railway Age***, and ***Railway Engineering and Maintenance***, at Chicago. On August 31, 1948, he was transferred to New York as eastern engineering editor of the former publication and eastern editor of the latter.

August J. Franke, secretary of the Woolery Machine Company, Minneapolis, Minn., died on September 16. Mr. Franke was born in Potosi, Wis., on November 11, 1870. He started railroad work in 1897 with the St. Paul & Duluth (now part of the Northern Pacific), where he remained until 1909. He then engaged in other activities until 1917, when he became associated with the Woolery Machine Company. He had served as secretary of the company since 1931.

August J. Franke



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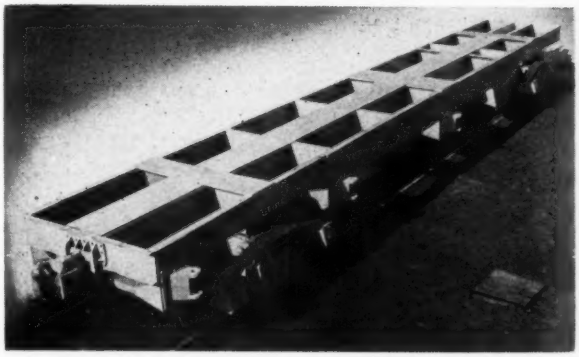

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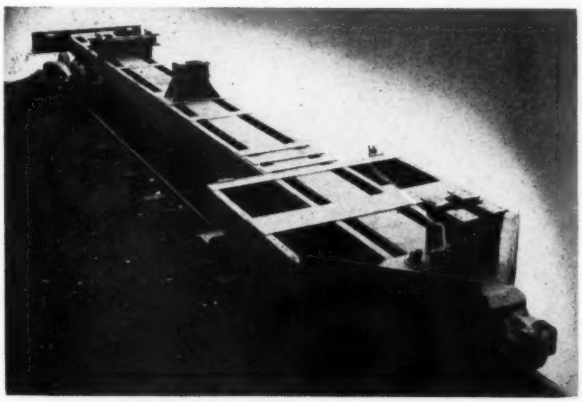

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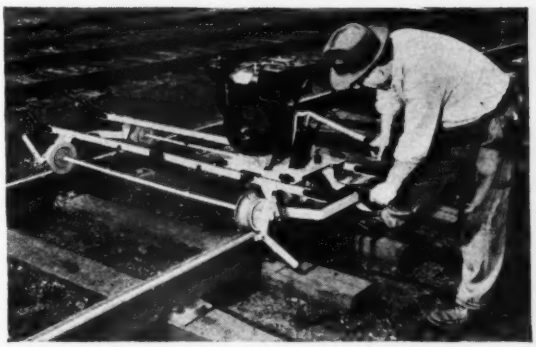

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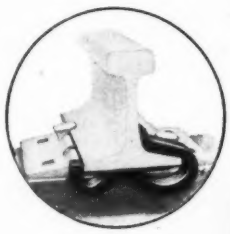

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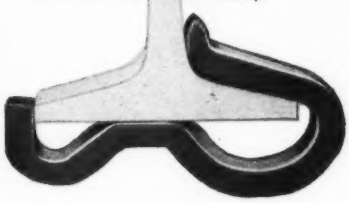

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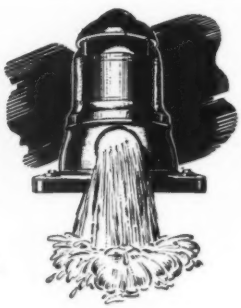

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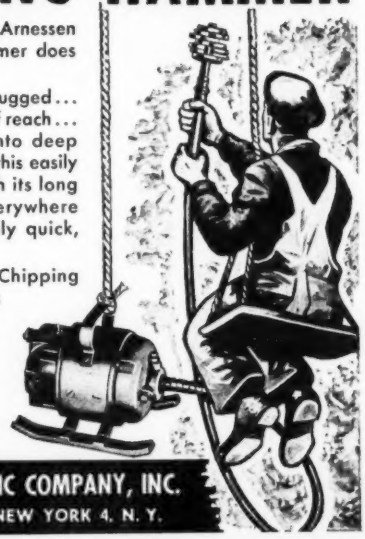

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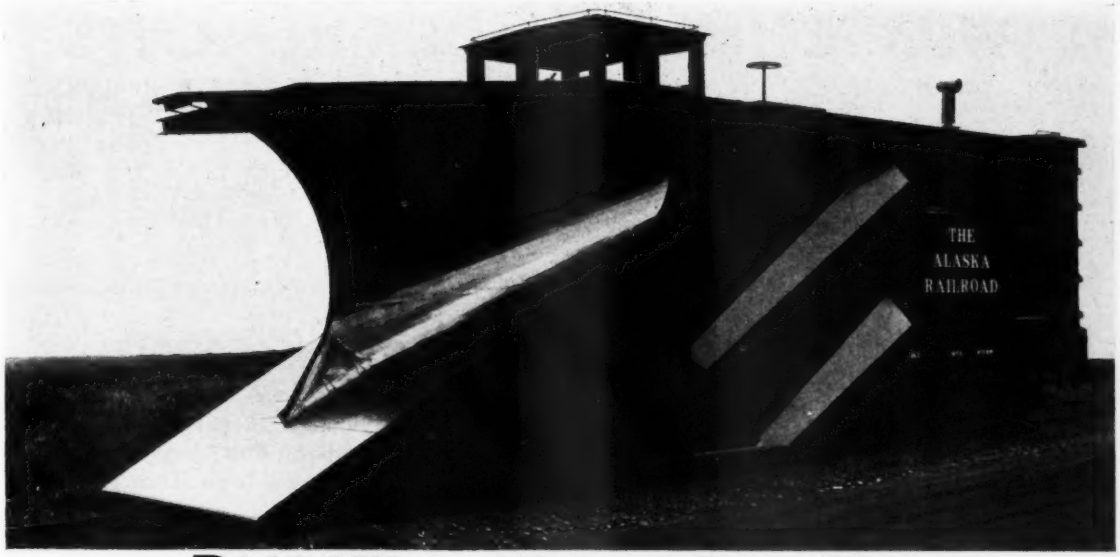

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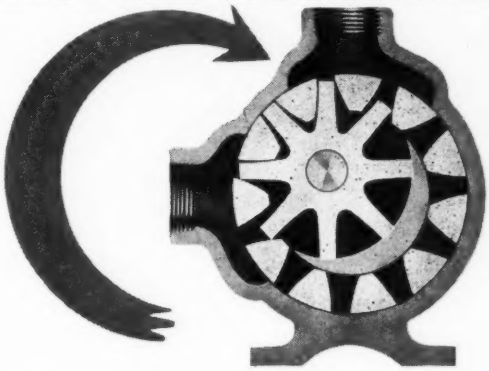

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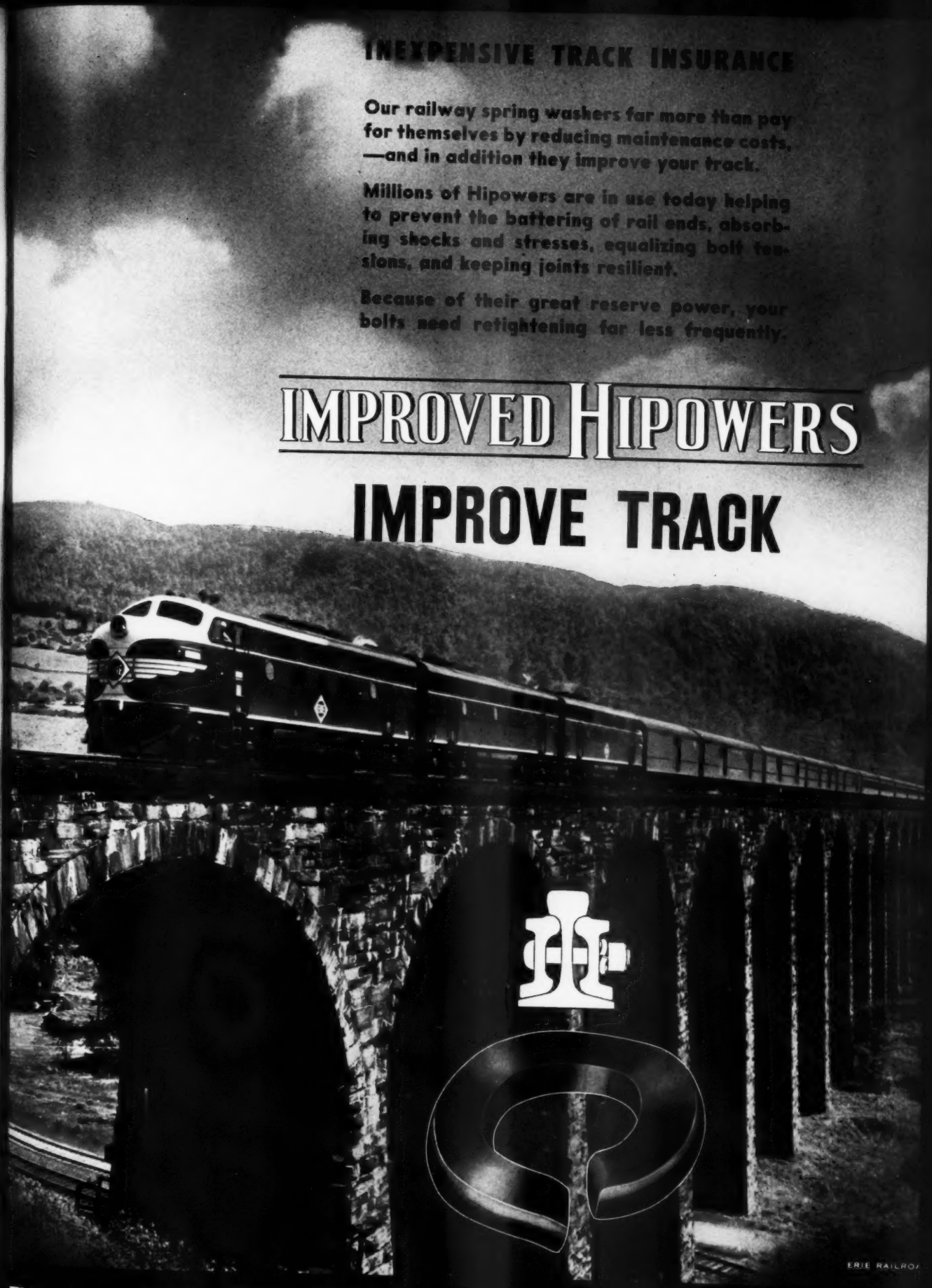
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